PLACE ATTACHMENT :
PUBLIC HOUSING RESIDENTS AND NEIGHBORHOOD PARKS

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SUMMARY

Fostering positive emotional bonding between residents and the environment in which they live has been emphasized as one of the most important objectives of environmental design. However, there is a lack of research on this phenomenon as well as its implications in architectural and planning literature. This phenomenon is even less explored in public housing context, where the development of decent common spaces usually is assigned with low priority, where benefits and advantages of open space to residents and community have not been fully explored, and where the validity of open space development is in dire need to be further addressed.

This study attempts to fill the gap in this area through empirical exploration of the phenomenon of people-place bonding in HDB new towns in Singapore, a city state renowned for its massive public housing programme. It is hoped that this study can help to achieve a better understanding of the relationship between people and place, advance open space planning in residential area, and contribute to the discourse of place in general.

This study centers on the core concept of place attachment, which is an important aspect of people-place relationship being of crucial pertinence to the ultimate goal of architectural and planning practices: creating place. Despite the increase of place attachment studies across a wide range of contexts and the accumulation of the insights gained from these studies in recent decades, there is a lack of consensus regarding the underlying theoretical framework that may guide the exploration of the phenomenon of place attachment, and there is also a lack of agreements regarding the answers to the questions: What is the nature of place attachment? What are the factors affecting it? What is the key mechanism underlying its development? and What are its impacts?

Based on review of place literature a tripartite theoretical framework is proposed which delineates the key components comprising the phenomenon of place attachment and the relationships between them. Guided by this framework, three groups of research hypotheses are proposed which specify respectively the multi-dimensional structure of place attachment, the effects of predictor variables from various domains on place attachment and especially the key mediating mechanism of identification with place meaning that underlies the development of place attachment, and the impacts of place attachment on place-related attitudes and behavioral intentions.

A survey was conducted and three neighborhood parks were chosen as the research settings based on their representativeness of landscape design. Residents living around the three parks were interviewed at their doorstep through a stratified sampling process. Data were collected from March to May in 2007 with the help of trained student assistants. The survey instrument is a self-administrated questionnaire containing both written questions designed to probe residents' use, perceptions, evaluations, feelings, thoughts, and other aspects of their relationships with neighborhood parks, and a photo preference rating task. A total of 400 residents took part in the survey and 368 qualified questionnaires were collected. Data were recorded and analyzed in statistical programs SPSS 14.0 and AMOS 6.0.

By providing substantial empirical evidence to support the hypothesized three-dimension (i.e. place caring, place dependence and place identity) structural model of place attachment, this study advances our understanding of the multidimensional nature of this construct and raises concerns over the validity of uni-dimensional theorization and operationalization of this multifaceted concept. More importantly, this study tested and confirmed the crucial role place meaning plays in the mechanism underlying the development of place attachment. This study provides evidence to support the notion that place attachment is a meaning-based concept in that identification with place meanings not only has strong and significant direct contributions to all the attachment dimensions, but also mediates the effects of other predictor variables of place attachment, either partially or completely. The findings emphasize the importance of understanding the meanings of a place as attribute by people in understanding people's attachment to the place.

The findings here offer important practical implications by stressing the need to shift from the current quantity-based, facility-provision oriented approaches in open space design to experience-creation oriented strategies which emphasize more on the qualitative side of recreation environment. This study also suggests that balanced landscape design strategies are needed to respond both to people's appeal for naturalistic landscape and to their longing for signs of human intention to care for the landscape. This study also provided evidence of the validity and utility of neighborhood parks in community-building and neighborhood revitalization in public housing areas. It questions the soundness of the current new town planning model in Singapore in which demand for higher density housing development replaces median scale open spaces such as neighborhood parks with smaller precinct common greens which have far lower potential in terms of fostering place attachment due to their physical limitations. Finally, the results highlight the necessity of public involvement in neighborhood open space planning and the advantages that place attachment study can bring to this process. It is suggested that direct involvement of residents in the design and management of nearby open spaces, for example, in the form of community garden, may feature an effective way to strengthen the emotional connection between residents and the neighborhood in which they live and therefore, contributing to a stronger sense of community.

Caution must be taken when interpreting and generalizing the research findings here considering the limitations of this study. Directions for future research are suggested, such as refining sampling procedures and measurement instrument, testing alternative structural models, conducting longitudinal analysis, including wider range of research contexts, and incorporating qualitative methods.

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CHAPTER 1. INTRODUCTION

Creating place lies at the core of the work of architects, landscape architects, and urban planners. Early research suggests that the positive emotional bond between individual or groups and place, or place attachment, is an essential aspect of people-environment relationship and it is of crucial pertinence to planners' and designers' task of place creation. This study proposes a theoretical framework to guide the exploration of the phenomenon of place attachment. Situated in the context of public housing estates in Singapore, it examines the nature, sources, mechanism, and impacts of public housing residents' attachment to nearby neighborhood parks as well as its implications to open space planning and design and place creation. This chapter begins with a brief introduction of urban open spaces in general and the status quo of open space development in public housing areas in particular, from which the importance of place attachment study regarding place creation is addressed, followed by discussion of knowledge gaps, research objectives, and research context.

1.1 Background

As integral parts of the urban built environment, urban open spaces are one of the key concerns of decision-makers, planners, designers, and resource managers. They have also been the focuses of academic research due to the important role they play in urban life (Carr, Francis, Rivlin, & Stone, 1992; Cooper-Marcus & Francis, 1997; Woolley, 2003). Open and public accessible spaces within urban areas have a long history (Carr, et al., 1992; Mumford, 1991). Be they monumental plazas or civic marketplaces, be they take the forms of meandering riverside parks or grand boulevards, be they emerge spontaneously over a long period or planned and constructed with specific visions in mind, these open spaces are actually where cities originally started from and where city lives are organized around. They are the platforms of people's everyday experiences, and they symbolize cities' social and cultural identities. The virtues of urban public spaces are deeply rooted in people's mind to the extent that, as put by Gehl (1996), they "constitute the very essence of the phenomenon 'city' " (p. 91).

No matter how the definitions of urban open space may vary in literature, ranging from the one that is defined physically as the land or waterbody in an urban area that is not covered by buildings or vehicles (Gold, 1980), and the one that emphasizes its fluid connection with urban life (Cranz, 1982), to the one that is described from a user's point of view as being an area that can accommodate various activities (Gehl, 1996), it is generally agreed that the planning and thriving of modern urban open spaces since the urban reform movement of the late nineteenth and early twentieth century was primarily motivated by the conviction that open spaces can contribute to the public's well-being and lack of such spaces may lead to substantial health costs in the long run (Thompson, 2002). The ever-increasing evidences on the benefits and opportunities provided by urban open spaces to individuals, communities, and the society in general, have been widely documented in literature (Carr, et al., 1992; Dwyer, McPherson, Schroeder, & Rowntree, 1992; Woolley, 2003)[1].

[1] Please refer to literature addressing the environmental (Dimoudi & Nikolopoulou, 2003; Dwyer, et al., 1992; Honjo & Takakura, 1990; Hough, 1984; Jauregui, 1990; Wilmers, 1990), socio-cultural (Adams, 1989; Hartig, Kaiser, & Bowler, 2001; Kaplan, 1995; Shinew, Glover, & Parry, 2004; Ulrich, 1984; Ulrich, et al., 1991; Van Herzele & Wiedemann, 2003),

The contemporary landscape of urban open space, however, exhibits quite diverse sceneries. Some urban open spaces are thriving with people and match closely the design intentions. Other open spaces are also well accepted and are used intensively, although the way they are used may not be what designers have intended. There are also open spaces that are underused and do not function as satisfyingly as expected. Some are almost empty or are abandoned totally (Whyte, 1980). The condition of open spaces in public housing context is even more worrying, where the most urgent need is to accommodate a large proportion of the low to middle-income population in low-cost, high-density residential buildings, and thus planning of landscaped common spaces is usually assigned with low priority compared with other aspects of the design of the built environment such as layout of building blocks and flat arrangement.

Due to financial constraints, standardized design and limited maintenance, many open spaces in public housing neighborhoods all too often end up in homogenous and barren settings with dilapidated facilities scattered in between the slab building blocks. Some of these vacant plots have become “sociofugal spaces”, places where people typically try to avoid one another rather than engage in social interactions (Hall, 1969; Kuo, Sullivan, Coley, & Brunson, 1998; Osmond, 1957). Moreover, contemporary open spaces in public housing are faced with both the pressure to meet diversified user needs resulting from rapid socio-demographic and cultural changes, and the threat of being reclaimed for development for other purposes as a result of fast urbanization. As urban population keeps increasing (United Nations Centre for Human Settlement, 1996), public housing seems to many urban dwellers, especially those in developing countries, an unavoidable choice, and the qualities of open spaces within these estates will undoubtedly have substantial impacts on the quality of the daily life and well-being of the residents. To justify the validity of open space development in public housing and maximize the values of these open spaces to residents, more research is needed to inform designers and decision-makers the various benefits and meanings of open spaces to public housing residents and approaches to achieve them through planning and design practices.

1.2 Open Spaces in Public Housing and Place Attachment

Following the seminal work that pioneers housing study such as Jan Jacobs (1961), Marc Fried (1963), and Oscar Newman (1972a, 1972b), previous research has revealed that, rather than being unnecessary luxuries or extras that are unaffordable in subsidized housing projects as might be thought by some, open spaces are indispensable components of the public housing neighborhood, since their physical environment with basic landscaping do benefit people and community in a variety of ways (Kuo, Bacaicoa, & Sullivan, 1998; Woolley, 2003). Besides echoing the benefits of urban open spaces in general, open spaces in public housing have their own merits through serving a number of important functions. Other than adjusting the climatic conditions and mitigating the harsh built environment of public housing estates in the same way as the other types of urban open spaces might influence their surrounding environment, landscaped open spaces provide their users with recreation opportunities as a relief from crowding, and an amiable setting that can improve physical and psychological health. The

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and economic benefits (Crompton, 2001, 2007; Francis, Cashdan, & Paxson, 1981; Geoghegan, 2002; Kaufman & Bailkey, 2000; Morancho, 2003) of urban open space.

improved psychological functioning of individual residents as a results of nature contact might yield healthier patterns of social functioning, such as more positive relations among neighbors, less aggressive behaviors, and enhanced psychological potential to cope with life problems (Kuo, 2001). Properly designed open spaces may attract public housing residents and thus increase their use of outdoor spaces and their opportunities for social interaction, which not only can increase informal surveillance of and control over the outdoor spaces, preventing violence and crime, but also has implications in fostering neighborhood social ties and increasing residents' satisfaction with their neighborhoods (Coley, Kuo, & Sullivan, 1997; Kuo, Bacaicoa, et al., 1998; Kuo & Sullivan, 2001a, 2001b; Kuo, Sullivan, et al., 1998; Kweon, Sullivan, & Wiley, 1998). Moreover, empowerment-oriented public housing open spaces development project with intensive community involvement was suggested to contribute to a strong sense of community (Feldman & Westphal, 1992).

However, there is also a growing concern with the prevailing perspective in research and practices of outdoor recreation settings that tends to regard these spaces as consumer products which are just the sum of interchangeable or reproducible features or attributes uniformly experienced by different individuals, and ignore the "meaningfulness" of place – a quality that is rarely reducible to tangible properties or the activities that occur within it (Williams, et al., 1992). Williams et al. (1992) argued that the limitation of the pervasiveness of the commodity metaphor in both academic research and design practice is rooted in an engineering-like emphasis on the manipulation and control of tangible properties of natural resources to meet recreation needs (p. 30). Thus settings are treated as means rather than ends. Under this perspective, the task of research is limited to just identifying the setting features necessary to support specific activities or desired experiences. Williams et al. (1992) further pointed out that the correlational relationship between the meaning of place and the substitutability of place is a negative rather than a positive one, which means that the more meaning an individual attach to a place, the less likely that he or she will be willing to substitute another place for it.

Similarly, researchers on people-environment relationship have criticized the instrumental perspective as it views the physical environment as a means to achieve behavioral and economic goals only. Stokols (1990) argued that "environmental settings are designed not only to facilitate the smooth performance of everyday activities but also to provide places to which people are drawn by virtue of their symbolic and affective qualities" (p. 642). Thus a spiritual perspective, which contrasts with the minimalist and instrumental view of people-environment relationship, was proposed, which "constructs the sociophysical environment as an end in itself rather than as a tool – as a context in which important human values can be cultivated and human spirit can be enriched" (p. 642). Stokols therefore contended that the quality of environment should be measured "in terms of the richness of their psychological and sociocultural meanings as well as in relation to physical comfort, safety, and performance criteria" (p. 642). So it is the task of research to identify those physical and social attributes that might contribute to individuals' experience of spiritual enrichment.

Among those individual experiences of spiritual enrichment discussed in research such as feelings of esteem, autonomy, restoration, and belongingness, the feeling of being deeply

connected to a place, i.e. place attachment, that might transcend the immediate experience of the setting has been continually emphasized as one of the essential psychological constructs. Like other types of urban public spaces, open space in public housing is not just a physical entity composed of individual design elements such as artificial or natural landscape features, facilities and furniture catering for specific recreational functions, but also a setting filled with people's perceptions, experiences, evaluations, feelings and thoughts. Although lacking in those splendid sceneries or fascinating landscapes that usually dominate some of the other types of public spaces like monumental plaza, national park, or tourism site, open spaces in public housing do have great potential to foster a positive emotional response among their users due to their immediate and tight association with people's quotidian life. Compared with those large rural parks and wildness areas, which are "chosen" recreation setting, where the emotional connections between users and the setting are all too often homogeneous and temporal, nearby open spaces in public housing areas, which are "given" recreation settings, are connected with residents' life in a more or less involuntary but diverse and intense way. Thus, the attachment towards these settings will be more complex and persistent once it is formed. In other words, considering their spatial and temporal salience, open space in public housing environment is one of the most promising places to which people may develop attachment feelings during their inhabitation.

Therefore, it is argued that nearby open spaces in public housing may undergo transformation and be perceived as special "places" in the process of residents' routine experiences within these settings in everyday lives, through which not only the characteristics of the physical and social environment are appreciated by people, but also the embedded meanings of these open spaces are identified with by them. As a result, residents may develop attachment, a positive emotional bond, to these settings in the process of people-place interaction. Even if people only have occasional relationship with these settings, as pointed out by Keller (1968), a "special feeling for a given place, a special sort of pride in living there, a sense of attachment transcending physical inconvenience or social undesirability" (p. 108) can still be fostered. Although the sources of this people-place tie vary from personal experience and familiarity to current sociocultural or physical attractions, as Keller emphasized, "it is perhaps this feeling, this link, above all, that planners would like to inspire in the neighborhood they design" (p. 108). Thus, it is contended that understanding residents' attachment to nearby open spaces is both relevant and necessary, and it has important implications for planning, design, and management of open spaces in public housing estates.

1.3 Knowledge Gaps

Research from a variety of disciplines suggests that place attachment may contribute substantially to "the formation, maintenance, and preservation of the identity of a person, group, or culture," and have positive effects "in fostering individual, group, and cultural self-esteem, self-worth, and self-pride" (Low & Altman, 1992, p. 10). Therefore, the emotional bonding between people and place is an important dimension that should be taken into consideration in the decision-making of planning and design of the urban built environment as well as natural resource management.

Despite the increase of literature from a variety of disciplines, there is still a lack of consensus among researchers regarding the dimensionality and the structural components of place attachment, the various sources of place attachment as well as their relative effects on place attachment, the key mechanism that underlie the development of place attachment, and the impacts of place attachment to people's attitudinal inclinations and behavioral intentions related to the design, planning and management of the physical environment. Moreover, despite the accumulation of empirical studies of place attachment across a variety of research contexts, especially outdoor recreational settings, there is a lack of study on residents' emotional attachment to nearby open spaces in public housing context. Effort is in dire need of addressing the following research questions:

1) The nature of attachment
- To what extent do public housing residents feel attached to nearby open spaces?
- What might be the sub-dimensions that underlie the attachment?

2) The sources of attachment
- What kinds of landscape features or configurations of nearby open spaces might be perceived by residents as distinctive in terms of evoking neighborhood identity? What is the relationship between landscape perception and open space attachment?
- What are the types and intensity of the diverse experiences that residents have in the open space? Are different types of open space experiences associated with different strength of open space attachment? Do open-space-based social interactions affect attachment?
- How might residents evaluate the quality of nearby open spaces? Are their evaluations associated with their attachment?
- What are the symbolic meanings that residents ascribe to nearby open spaces? Is the level of residents' agreement with the meanings attributed to these places associated with their attachment?
- What are effects of residents' socio-demographical characteristics on their level of open space attachment?
- What is the relative effectiveness of these predictive factors in terms of predicting attachment"? and what might be the key factor underlying the developmental mechanism of attachment?

3) The impacts of attachment
- What are residents' attitudes toward the management of nearby open spaces? To what extent may residents' open space attachment affect their attitudes toward the environment management of these settings?
- How will residents respond to hypothetical undesirable changes that would happen to their nearby open spaces? Is residents' attachment associated with their behavioral intentions regarding their responses to these negative changes? Is residents' attachment associated with their willingness of community participation related to nearby open spaces?
- How will residents' attachments to nearby open spaces contribute to their overall sense of belonging to the neighborhood community in which they live?

1.4 Research Objectives

This dissertation attempts to explore the phenomenon of people-place bond and its implications

to the decision-making of planning, design, and management of the physical environment. Specifically, this study seeks to develop a theoretical framework of place attachment and investigate, according to this framework, residents' attachment to nearby open spaces in public housing context and its relationship with characteristics of the physical setting, people's environmental perception and experience, and the attributed meanings of the setting.

A major goal of this study is to achieve a better understanding of the nature of the phenomenon of place attachment by examining its dimensional structure through model comparison. The second objective is to explore the sources of place attachment by examining the effects of factors on place attachment, such as perception of physical characteristics of environment, experiential patterns, evaluative judgments, as well as people's socio-demographic characteristics. The third objective is to understand the key mechanism that underlies the development of place attachment by examining the mediating effect of level of identification with place meaning. The fourth objective is to determine the impacts of place attachment by examining the effect of attachment to nearby open space on people's attitudes and behaviors as well as their sense of belonging to the neighborhood in which they live.

In summary, this study aims to advance our understanding of the emotional connection between people and place and contribute to the theoretical discussion of people-environment relationship. Moreover, this study aims to improve planning and design practices of open spaces by providing recommendations to encourage innovative planning, design, and management strategies of open spaces. It is hoped that this study may contribute to the creation of urban open spaces that respond to the physical and psychological needs of the users, encourage diverse social interactions, create distinctive place identity, and evoke strong identification with the meanings attributed to the settings. Therefore, a positive emotional bond between people and open space can develop, a strong sense of belonging be fostered, and the quality of community life be improved.

1.5 Research Context

According to previous research, community is "an appropriate level of analysis for identifying stakeholders' attachments to public lands and for understanding some of the important influences on emotional attachments to special places" (Eisenhauer, et al., 2000, p. 439). As Feldman (1990) noted, "people may experience positive and intense psychological bonds with the tangible surroundings of the home environs" (p. 184). Since the recreational open spaces within public housing estates are planned to encourage social interactions in a specific setting provided with equipment and surrounded by unique landscapes, human bonding with these recreation places might be a common occurrence (Kruger & Jakes, 2003). It is based on these arguments that the neighborhood parks in Singapore's HDB[2] new towns were chosen as the research settings for this study.

Compared with other countries, where subsidized housing constitutes only a small portion of the overall housing landscape, public housing is the predominant housing typology in Singapore

[2] The HDB (the Housing and Development Board) is Singapore's statutory authority that is in charge of the planning, design, construction and management of the public housing estates of the whole nation.

and nearly 85% of the population is accommodated within these estates. In a sense, the city's built environment is actually characterized by the massive scale of the development of the HDB new towns across the island and their prominent high-rise, high-density building form almost entirely implemented due to limited land resource (Figure 1. 1).

Figure 1. 1 Open spaces in HDB new towns
(Source: HDB Annual Report)

The public housing program in Singapore have received considerable acclaim for its outstanding achievements in solving housing problems and creating a high quality living environment at the same time for its multi-racial population (Figure 1. 2). These achievements are also reflected in the trajectory of the evolution of the open spaces within the city's public housing estates from just leftover plots in between building blocks to meet basic hygiene requirements to integral components of the new town planning model and symbols of quality of life. Over the years, a hierarchy of open spaces, ranging from regional parks, town parks/gardens, park connectors, neighborhood parks, precinct playgrounds, to void-deck areas downstairs, have emerged in HDB new towns that accommodate a wide range of facilities and services catering to residents' recreation needs[3]. The prominent role of HDB open spaces in Singapore's urban open space system is evident, since the extensive development of these spaces not only makes substantial contributions to the characteristics of respective HDB new towns, but also enhances significantly Singapore's national image – a tropical garden city, as envisaged by the government.

Although Singapore's unique experiences of open space development in public housing may not be able to transplanted as a general recipe to other regions because they are deeply rooted in the country's specific geographic and socio-cultural context, the abundance and diversity of the existing open spaces within HDB new towns furnishes a good opportunity to explore the people-place relationship and provides a good laboratory to examine the effectiveness of open spaces on fostering sense of attachment among residents and explore the role that open space might play in the process of creating a living environment people feel belonging to.

[3] For thorough review of the historical trajectory of HDB and open space development in Singapore, please refer to Wong and Yeh (1985), Yeh (1989), Ooi (1992), Yuen (1995, 1996a), Teo et al. (2004), and Tan (2006).

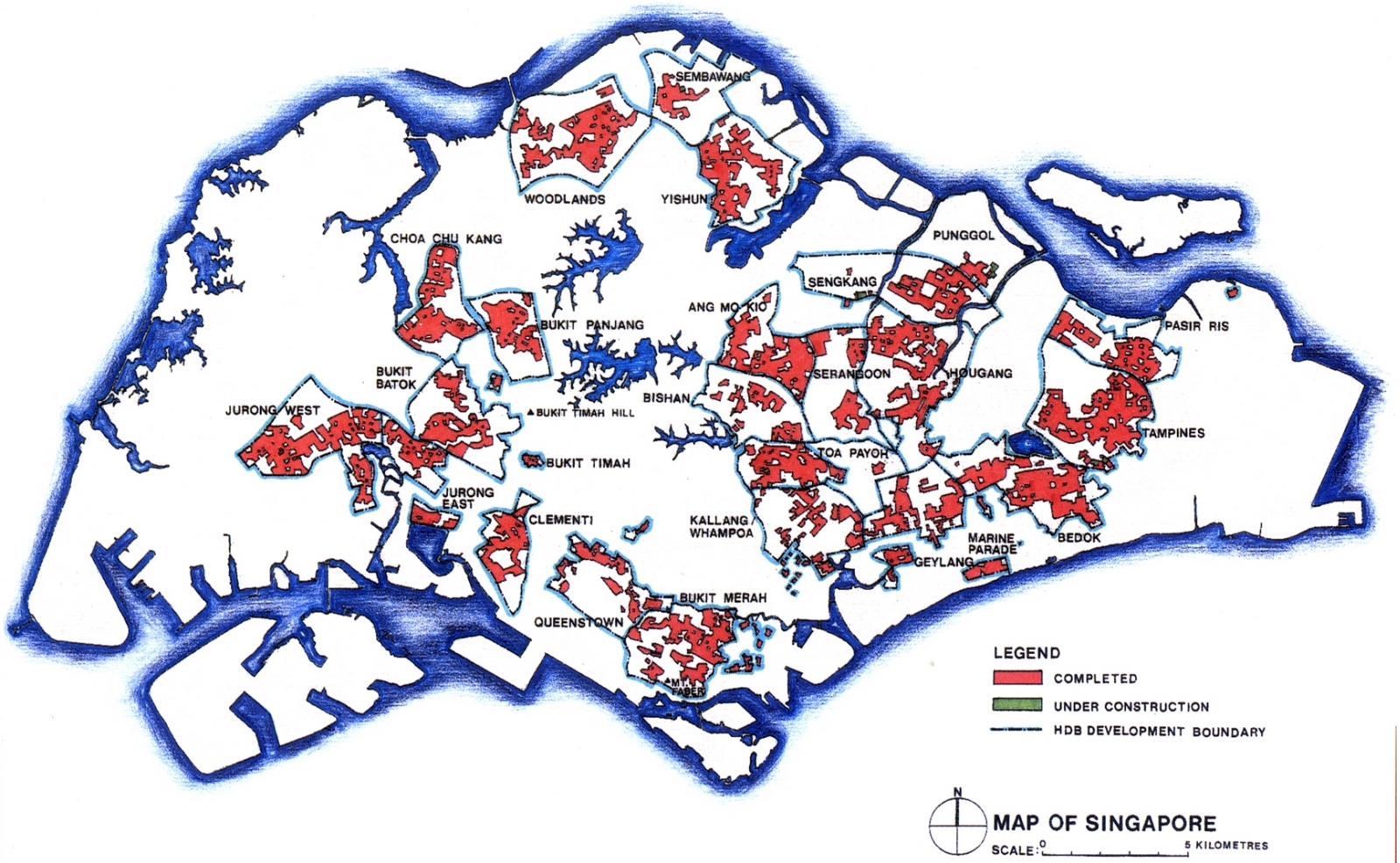


Figure 1. 2 Location of HDB new towns

(Source: HDB Annual Report 2002-2003)

Among those important issues regarding open space planning “sense of rootedness” has been recognized as one of the key objectives of open space provision in a recent governmental report (Urban Redevelopment Authority, 2002). This demonstrates that the authorities has gradually realized that open spaces not only can be provided as counterparts to the concrete built environment but also can help to build connections with Singapore’s cultural, historical and natural heritage and “offer a sense of rootedness in a society that is changing so rapidly” (p. 5). Local survey (Fong, 2005)[4] has shown the effectiveness of HDB’s efforts in planning self-sufficient neighborhoods and in creating a sense of belonging to the new town, and it also revealed a high level of satisfaction to the functionality of open spaces within the new towns among the residents. However, there is a lack of research to address the emotional bonding between HDB residents and their nearby open spaces and how this attachment may contribute to the formation of residents’ sense of belonging. It is the connections between environmental design of open spaces in public housing, residents’ environmental experiences and evaluation of these settings, and residents’ emotional bonding with these places that are of interest here. It is believed that this kind of empirical enquiry is especially pertinent to the creation of open spaces that might be identified by residents as meaningful places, and it will shed lights on how to achieve the key goals embedded in HDB’s open space planning agenda such as providing diverse recreation opportunities, encouraging social interactions, creating distinctive identity and character, and fostering sense of community.

1.6 Overview of Chapters

The first Chapter introduces the background of the current study, the research questions to be addressed, and the research objectives to be achieved. Chapter Two presents the theoretical background and research framework of this study. Both literature on people-place relationship in general and literature on place attachment studies in particular are reviewed. Consensus and disagreements of the current research in this area are discussed. Key research needs in this area are identified. The theoretical framework and research hypotheses that guide this study are proposed as well. Chapter Three presents the research methods adopted in this study. Specific research strategies, including choosing of the research settings, sampling of participants, survey instrument, and procedures and rationale of data analysis, are described. Chapter Four reports the preliminary results related to the individual constructs explored in this study. New variables resulted from data reduction procedures are constructed as well. The relationships between the key constructs are reported in Chapter Five, in which the research hypotheses are examined in a structured way. The last chapter of this dissertation summarizes the main research findings and discusses their implications to planning and design of open spaces in public housing, as well as the contribution to people-place relationship research. Limitations of this study and possible directions for future research are also discussed.

[4] According to this report, 90% of the residents interviewed in the household survey indicated a sense of belonging to the towns they live in, a ratio higher than that of 1998, and 93.4% of the respondents were highly satisfied with estate facilities, among which park ranked the third.

CHAPTER 2. LITERATURE REVIEW AND RESEARCH FRAMEWORK

This chapter provides a review and discussion of literature upon which this study is based. First, theories and studies related to the concept of place are reviewed to clarify the foundation of the construct of place attachment. Second, research aiming at conceptualizing and measuring place attachment is discussed. Third, research needs emerged from literature review are identified. Fourth, a theoretical framework that guides the current study is delineated. Finally, research hypotheses regarding each aspect of the theoretical framework are proposed.

2.1 Place and Sense of Place

This section provides a review on literature that devotes to the theoretical discussion of place-related concepts and notions. Two similar but distinct concepts: place and sense of place, the very fundamental constructs upon which the concept of place attachment is built, are reviewed.

2.1.1 Place

Place is one of the essential concepts of the philosophical discussions within many research areas, such as humanistic geography, environmental psychology, and sociology. It plays a profound role in human existence, as declared by Martin Heidegger (1958), "'place' places man in such a way that it reveals the external bonds of his existence and at the same time the depths of his freedom and reality" (quoted in Relph, 1976, p. 1). As important sources of individual and communal identity, places are "profound centres of human existence to which people have deep emotional and psychological ties" (Relph, 1976, p. 141). Place is also an essential concept in architectural and urban planning research, since the ultimate task of architects and planners is suggested to be creating existential spaces - "a system of meaningful places that give form and structure to our experiences of the world" (Norberg-Schulz, 1980, p. 226).

Space

Many believe that place is best understood in reference to the concept of space (Tuan, 1977), because space and place are multifaceted and interdependent (Sack, 1997, p. 31). As Relph (1976) pointed out, "space provides the context for places but derives its meaning from particular places" (p. 8). Space is primarily thought of as "a pattern of location, a system in which the places of human experience have significance primarily as geometrical coordinates or identical dots on a map…, calmly waiting to have meanings assigned to it" (Ryden, 1993, p. 37). Space is general, geometrical, undifferentiated, detached from material form and cultural interpretation (Gieryn, 2000, p. 465). It is also "amorphous and intangible and not an entity that can be directly described and analyzed" (Relph, 1976, p. 8). Tuan (1975), in elaborating on the differences between space and place, noted that space "… lacks content; it is broad, open, and empty, inviting the imagination to fill it with substance and illusion; it is possibility and beckoning future. Place, by contrast, is the past and the present, stability and achievement" (pp. 164-165). Tuan (1977) continued that space "has no trodden paths and signposts. It has no fixed pattern of established human meaning; it is like a blank sheet on which meaning may be imposed" (p. 54).

Place

Compared with space, which is abstract and universal, place is concrete and particular (Walter, 1988 cited in Ryden, 1993). What separates places from the surrounding space are their faculties to concentrate our intentions, attitudes, purposes and experiences (Relph, 1976, p. 43). Places are thus considered to be “fusions of human and natural order and are the significant centers of our immediate experiences of the world” (Relph, 1976, p. 141).

Early discussion on concept of place can be traced back to the philosophical discourse between Plato’s doctrine of place as an active receptacle of shapes, powers, feelings, and meanings that energizes and nourishes its contents and whose qualities cannot be abstracted from the things contained in it, and Aristotle’s doctrine of place as a neutral container that is separable from the being it contains and thus can be understood apart from people (Relph, 1976; Walter, 1988). Walter (1988) argued that, compared with Aristotle’s interpretation of place as detachable container, Plato’s view of place as active receptacle is a much richer notion, for it suggests an active interrelationship and a deep connection between place and those who dwell in it. This led Walter brought forth his own definition of place as the “location of experience; the container of shapes, powers, feelings and meanings” (p. 215).

German philosopher Martin Heidegger's work concerns for the relationship between architecture and place who delves into the fundamental question of "Being" and "Dwelling" that are regarded as being of crucial pertinence to human existence. Heidegger wants to remind us that our everyday life-world is a totality made up of concrete things rather than abstract concepts as proliferated by modern science and technology that has led to the alienation of existence. In Heidegger's opinion, the world is a fourfold oneness, consisting of earth and sky, divinities and mortals. In between the sky and earth is the world where human life takes place. He believes that in order to dwell authentically, we need to dwell poetically and that this is the ultimate aim of architecture as it belongs to poetry. Architecture may be defined as the making of place, a location or "lived space", because by opening up a world - the totality of things - while at the same time setting it again back on earth, architecture manifests the two aspects of spatiality as location - admittance and installment - that is a property of being-in-the-world. In other words, "a work of architecture therefore discloses the spatiality of the fourfold through its standing there" (Norberg-Schulz, 1996a, p. 437). In this regard, Norberg-Schulz believes that Heidegger's thinking on architecture as a visualization of truth "restores its artistic dimension and hence its human significance" (p. 438).

A parallel of thoughts on place emerges when comparing the “inhabited landscape”, defined by Heidegger as the non-mathematical, non-isomorphic space where human life take place and where the fourfold is manifested through the buildings which bring it close to man (Norberg-Schulz, 1996a), with what claimed by French scientist and philosopher Gaston Bachelard, who sought to “reinvigorate our understanding of the rational by emphasizing the complexity of its material situation”(Leach, 1997, p. 85), that “inhabited space transcends geometrical space” (Bachelard, 1994, p. 47). Both scholars are critical of technoscientific positivism and abstract rationales, defying the Aristotelian and Cartesian conceptualization of space as container of three-dimensional objects, and urge a return to the building of “place” that

is composed of concrete things and lived experiences - the poetics of dwelling. Scholars such as Henri Lefebvre and Anthony Vidler have pointed out that there is a "shared aura of nostalgia" permeating in the examples they used to elucidate their ideas, i.e. Heidegger's German peasant hut in Black Forest and Bachelard's French rustic abode in Champagne, as the poetic dwelling image depicted is a counter of the terrible contemporary urban reality and a symptomatic response to the experience of an *unheimlich* (uncanny) modernity (cited in Ockman, 1998).

A tripartite view toward the definition of place emerges from contemporary place theories that describes place as consisting of three interwoven components: physical setting, human activities, and human psychological processes relating to it (Brandenburg & Carroll, 1995; Relph, 1976, 1985b). It is believed that the dialectics between these components and their fusion constitute the identity of that place (Relph, 1976, p. 48). For example, geographer Relph (1976, p. 141) noted that places are not "abstractions or concepts, but are directly experienced phenomena of the lived-world and hence are full with meanings, with real objects, and with ongoing activities". He pointed out that an phenomenological understanding regards places as "tightly interconnected assemblage of buildings, landscapes, communities, activities, and meanings which are considered in the diverse experiences of their inhabitants and visitors" (Relph, 1996, p. 907). This theoretical standpoint was also reflected in his later definition of place as "a whole phenomenon, consisting of the three intertwined elements of a specific landscape with both built and natural elements, a pattern of social activities that should be adapted to the advantages or virtues of a particular location and a set of personal and shared meanings" (Relph, 1985a).

Canter (1977, p. 158) proposed from environmental psychology perspective that place is the result of relationships between actions, conceptions and physical attributes (Figure 2. 1). He suggested that full identification of place should involve the understanding of 1) what behavior is associated with a given locus, 2) what the physical parameters of that setting are, and 3) the description, or conception, which people hold of that behavior in that physical environment. Although Relph (1978) has criticized that the term "place" was used as little more than a synonym for "environment" throughout Canter's book, some believed that what is valuable about Canter's argument lies in his emphasis on the necessity of understanding the perspective of the users (Sime, 1986, p. 56).

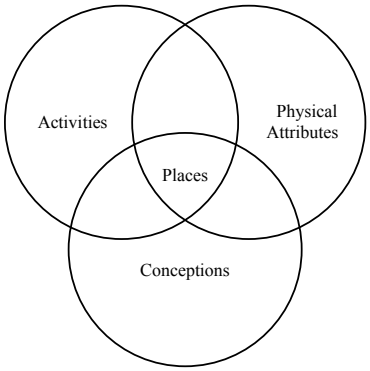


Figure 2. 1 Metaphor of the nature of place

(Source: Canter, 1977, p. 158)

Similarly, Gieryn (2000, pp. 464-465), in an attempt to urge a place-sensitive sociology, argued that place has three necessary and sufficient features: 1) geographic location, which denotes a place as “a unique spot in the universe”, 2) material form, which means that place is “a compilation of things and objects at some particular spot through which social processes happen”, and 3) investment with meanings and values, which implies that place “are interpreted, narrated, perceived, felt, understood, and imagined” when it is created.

Different opinion was offered by Agnew (1989, p. 2), who as a geographer, stated that the three constituent elements of place, namely, 1) location or the spatial distribution of social and economic activities that is emphasized by economic geographers, 2) locale or the settings in which everyday routine social interactions are constituted that is emphasized by humanistic geographers; and 3) sense of place or identification with a place emotionally or symbolically engendered by living in it that is emphasized by cultural geographers - should be considered as complementary dimensions in defining a geographical concept of place, because “local social worlds (locale) cannot be completely understood apart from the macro-order of location and the territorial identity of sense of place”.

The aforementioned theoretical discussion of place suggests that, on the one hand, place has physicality which is represented by its material form, through which the social processes unfold (Habraken & Teicher, 1998). It provides “both the real, concrete settings from which cultures emanated to enmesh people in webs of activities and meanings and the physical expression of those cultures in the form of landscapes” (cited from Preface of Agnew, 1989). The physical environment provides the backdrop to the various human activities whilst being complemented by and influencing these activities (Relph, 1976, p. 46).

On the other hand, place is characterized by the meaning attributed to it. Tuan (1977, pp. 6, 54, 136) incorporated meanings into his definition of place as a “center of meaning or field of care” or a “calm center of established values”, and stated that “what begins as undifferentiated space becomes place as we get to know it better and endow it with value" or as it “acquires definition and meaning”. Relph (1976, p. 22) also agreed that “places … can be understood as centres of meaning, or focuses of intention and purpose”, which “constitute significant centres of experience within the context of the live-space of everyday social world”. The meanings ascribed to a place may belong to various dimensions, ranging from symbolic, emotional, cultural, political, and biological (Buttimer, 1980, p. 167).

Meanings of place are the products of place-related experience. As Ryden (1993) stated, “a place . . . takes in the meanings which people assign to that landscape through the process of living in it”. Tuan (1975, p. 152) noted that as a centre of meaning place is constructed by experience. Through experience, unknown spaces becomes familiar place, “abstract space, lacking significance other than strangeness, becomes concrete places, filled with meaning” (Tuan, 1977, p. 199). Relph (1976, p. 141) contended that “places are defined less by unique locations, landscapes, and communities than by the focusing of experiences and intentions onto particular settings”. He further elaborated that “the meanings of places may be rooted in the physical setting and objects and activities, but they are not a property of them – rather they are a

property of human intentions and experiences" (Relph, 1985b, p. 47). This is why places are different from, though related to, space and landscape qualitatively in their experiential dimension, because they are "constructed in our memories and affections through repeated encounters and complex associations" (Relph, 1985b, p. 26). Through differentiating the authentic experience of insider of a place and the inauthentic experience of outsider to the place, Relph claimed that it is the experience of being inside that sets place apart in space.

2.1.2 Sense of Place

Contemporary interests on the concepts of place and sense of place root in a deep concern with the pervasiveness of "flatscape", landscapes full of mediocre experiences and devoid of intentional depth (Norberg-Schulz, 1980, cited in Relph, 1976), and the phenomenon of lacking of place awareness in modern society (Relph, 1976; Tuan, 1974b), as the results of "gradual spatial uniformity, increased mobility and hence a purely functionalistic relationship with places" (Giuliani, 2003, p. 146).

Spirit of Place

Based on the works of Martin Heidegger (1962, 1971), who defined man's existence as "Being-in-the-world" and believed that dwelling in a place symbolizes a person's existence, architectural historian and theorist Norberg-Schulz (1980) argued that the concept of place defines the characteristics of "existential space". Norberg-Schulz believed that "***genius loci***", an ancient Roman concept which refers to the guardian spirit of a particular place that determines an "environmental character", denotes the essence of place. He argued that "the existential purpose of building (architecture) is therefore to make a site become a place, that is to uncover the meanings potentially present in the environment" (p. 18). Thus the creation of architecture is expected to be a process to make a total environment visible, to "concretize the genius loci" (p. 23). Based on this notion Norberg-Schulz examined three landscapes of distinctive characters, Prague, Khartoum and Rome, and pointed out that, in contrast to these cities which manifest the qualities of "place" clearly, the monotonous modern architecture and town planning are characterized by a lack of the properties of distinctiveness and a loss of spirit of place.

Placelessness

Relph (1976) conceptualized the phenomenon of disregarding *genius loci* as **placelessness**, which is "the casual eradication of distinctive places and the making of standardized landscapes that results from an insensitivity to the significance of place"(Relph, 1976, Preface). Relph pointed out that, in contrast to an authentic attitude to place that denotes a direct and genuine experience of the entire complex of the identity of places without being mediated and distorted through arbitrary social and intellectual fashions, what underlies the phenomenon of placelessness is an "inauthentic attitude" to place, which "… involves no awareness of the deep and symbolic significances of places and no appreciation of their identities" (p. 82). Thus, according to Relph, placelessness can be described as both an environment without significant places and an attitude which gives no credit to significance in places. This inauthentic attitude to place is manifested either self-consciously through the application of technique to place in the form of planning, or unselfconsciously through uncritical acceptance of stereotyped and superficial mass values. Relph concluded that, although the trend toward a placeless geography,

which is characterized by other-directedness in places, uniformity and standardization in places, formlessness and lack of human scale and order in places, place destruction, and impermanence and instability of places (p. 118), may seem dominant now, it can be transcended through the endeavor of design that aims at creating a lived-world of significant places.

Conceptualizing Sense of Place

Compared with placelessness, which implies a disregard for the essence of place, sense of place is regarded as "the awareness of spirit of place" (Relph, 1996, p. 910). Datel and Dingemans (1984, p. 135) conceptualized sense of place as an integration of a complex bundle of meanings, symbols, and qualities associated with a particular locality or region by individual or group, either consciously or unconsciously, through either direct contact with the place or indirect cultural experiences. It is "people's subjective perceptions of their environments and their more or less conscious feelings about those environments" (Steele, 1981, cited in Hummon, 1992). Sense of place features an important role in human existence, as Ryden (1993) argued that "… sense of place endures all vicissitudes, then, sustaining identity, providing connections to a personal and collective past, offering an emotional center. It is a rooted and anchored locus of meaning and value" (p. 95).

Williams and Stewart (1998) defined **sense of place** as "the collection of meanings, beliefs, symbols, values, and feeling that individuals or groups associate with a particular locality" (p. 19). They argued that the multifaceted nature of this concept is represented by three aspects: 1) the emotional bonds that people form with places (at various geographic scales) over time and with familiarity with those places; 2) the strongly felt values, meanings, and symbols that are hard to identify or know (and hard to quantify), especially if one is an "outsider" or unfamiliar with the place; 3) the valued qualities of a place that even an "insider" may not be consciously aware of until they are threatened or lost; 4) the set of place meanings that are actively and continuously constructed and reconstructed within individual minds, shared cultures, and social practices; and 5) the awareness of the cultural, historical, and spatial context within which meanings, values, and social interactions are formed.

In analyzing the phenomenon of longing for roots and rebuilding a sense of place in contemporary American culture, Tuan (1980) suggested that **rootedness** is concerned with a feeling of unself-conscious dwelling, whereas **sense of place** implies "a certain distance between self and place that allows the self to appreciate a place" (p. 4). What distinguishes these two concepts, as Tuan suggested, is that the former cannot be maintained by taking thoughtful and deliberate steps, whereas the later can be thus achieved and maintained (p. 4). Rootedness, as exemplified by some of the isolated aborigines cited in the paper, is "an unreflective state of being in which the human personality merges with the milieu" (p. 6). It is characterized by "an incuriosity toward the world at large and an insensitivity toward the flow of time" through long term habitation at one locality (p. 4). In essence, it means a sense of being completely at home, a sense of security and comfort, as a result of people's "pleasantly humdrum and timeless" lives (p. 5). Sense of place, on the other hand, is the result of conscious effort of "knowing about" the past through enhancing a "historical consciousness" (p. 8). Tuan is concerned that those deliberate acts of searching the past in modern times may risk blurring the sense of time and

“uprooting people from their state of unselfconscious at-homeness” (p. 8).

Although Tuan’s differentiation between the two terms is helpful in discerning those superficial efforts to create fake place identity, Hay (1998a) embraced the integrated concept of “**rooted sense of place**”, as he argued that everyday forms of rootedness are necessities to the development of sense of place, thus the conceptual division between rootedness and sense of place was not tenable. In a later study, Hay (1998b) differentiated various degrees of sense of place (Figure 2. 2), ranging from 1) the superficial sense of place among tourists and transients, 2) the partial sense of place among long-term visitors and holiday-home owners, 3) the personal sense of place typical of new residents without roots in the place, to 4) ancestral and 5) cultural senses of place among indigenous residents with both roots in the place and spiritual ties. Hay argued that the development of sense of place is particularly influenced by residential status.

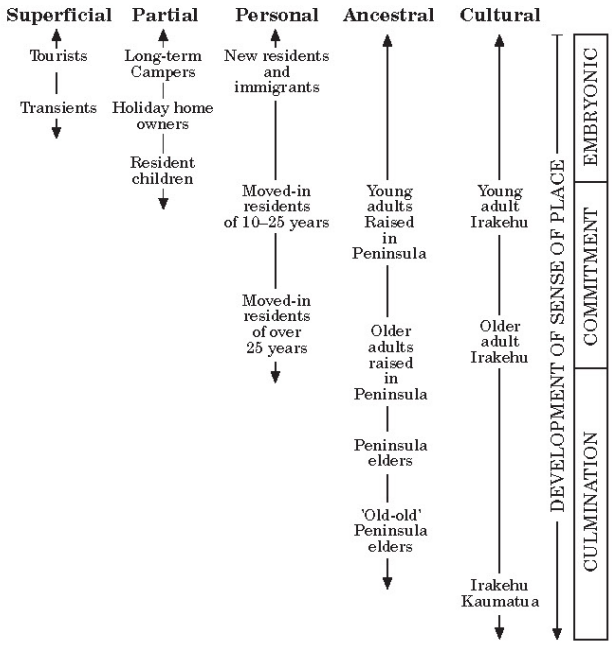


Figure 2. 2 Typology of sense of place

(Source: Hay, 1998b, p. 9)

In a study of community sentiment in particular and sense of place in general, Hummon (1992) identified two types of rootedness: **everyday rootedness**, which is represented by a moderate sentiment toward the community in an unselfconscious and taken-for-granted form, and **ideological rootedness**, which is represented by consciously articulated strong sentimental identification with the community. These two types of rootedness which bear close resemblance to Tuan’s (1980) general notions of rootedness and sense of place respectively, however, are regarded by Hummon as just two sub-categories within five types of sense of place, the other three typologies are: place alienation, which is a profound estrangement from a place, place relativity, which is represented by complex and ambivalent perception toward place and few emotional tie to place, and uncommitted placelessness, which is represented by a lack of sense of local identity and an indifference toward place.

Hummon's (1992) classification of sense of place echoes Relph's (1976) conceptualization of our experience of outsideness and insideness. According to Relph (1976), the essence of place is represented by "the experience of an 'inside' that is distinct from an 'outside'" (p. 49). This strong experience of belonging to a place and identifying with it was termed **insideness**, which is manifested in seven different levels (Table 2. 1), ranging from 1) existential outsideness, which involves a profound alienation from all places, 2) objective outsideness, which treats places as concepts and locations that can be emotionally detached, 3) incidental outsideness, in which place is experienced as mere incidental background or setting for activities, 4) vicarious insideness, which is derived from indirect experience of place via other media, 5) behavioural insideness, which means an active physical involvement in a place, 6) empathetic insideness, which implies emotional participation in and involvement with a place, to 7) existential insideness, which denotes complete and unselfconscious commitment to a place (pp. 51-55).

Table 2. 1 Typology of Insideness according to Relph

	People-place Relationship	Attitudes toward Place	Identity of Place as Experienced
Existential Outsideness	People and place are detached from each other	Self-conscious and reflective uninvolvement, alienation	Meaningless, distinguished by superficial qualities
Objective Outsideness	Deep separation between people and place	Dispassionate, objective	Objective attributes
Incidental Outsideness	Functional and mechanical association between people and place	Limited and partial intentions	Incidental background or setting for activities
Vicarious Insideness	Imaginary resonance	Fascination and imagination	Deeply felt involvement , received indirectly
Behavioral Insideness	Passive involvement and appreciation of place	Attending to the appearance deliberately	Having observable and unique visual qualities
Empathetic Insideness	Deep emotional connection	Empathetic emotional involvement and active appreciation	Deep and rich in meanings, of complete personality
Existential Insideness	Implicit however profound bond between people and place	Unselfconscious reflection or involvement	Place is part of the person and the person is part of the place

(Compiled by the author according to Relph , 1976)

The concept of "insideness" was further explored by Rowles (1983), who, through an participant observational study of a group of elderly residents, found that there was a sense of "insideness" that differentiated the local community and its surroundings, and a feeling of attachment was particularly strong among these old residents. Three components were suggested to be involved in "insideness": 1) a sense of physical insideness, which denotes an inherent "body-awareness" of the details of the everyday living environment developed among the residents; 2) a sense of social insideness, which derived from integration with local social network; and 3) a sense of autobiographic insidness, which captures a wide range of meanings associated with "incident places". Rowler argued that the autobiographic insideness is the most important one because it "provides the basis of the symbiosis of attachment to place and personal identity in old age" (p. 304).

Other than humanistic geography oriented discussion of sense of place, as exemplified by Tuan, Relph and Hummon's work, there was also attempt to examine the concept of sense of place empirically through quantitative assessment. Similar to Relph (1976), Shamai (1991) regarded sense of place as taking different forms in a spectrum. Shamai suggested that the development of sense of place may be characterized by three phases, which are belonging to a place, attachment to a place, and commitment to a place (p. 349). In an attempt to test the different levels of intensity of this construct empirically, Shamai proposed a scale that described seven stages of sense of place: 1) not having any sense of place; 2) knowledge of being located in a place, which means being aware of the spatial characteristics and the symbols of a place, but having no feeling of bonding to it; 3) belonging to a place, which means a feeling of belonging to a place and a feeling of togetherness; 4) attachment to a place, which means an emotional attachment to a place due to its central role in people's lives and its special personality; 5) identifying with the place, which implies a fusion and blending with the place; 6) involvement in a place, which implies an active participation and commitment to a place; 7) sacrifice for a place, which implies a willingness to give up personal or collective interests in order to sustain a valued place. A survey of Jewish students in Toronto that implemented this scale found that the students' sense of place differed between the city of Toronto, Ontario, and the Canada. Although Shamai pointed out that the scale is exploratory, and cannot be applied in all other research contexts, her study do offered an alternative perspective to phenomenological approach in probing the nature of sense of place.

Development of Sense of Place

A common emphasis across the aforementioned theorization is that sense of place is the product of people's experience with that place. The development and manifestations of sense of place is dynamic and multifaceted, because the foundation upon which this concept is constructed – place – is not a static, single entity, but rather is dynamic, and changes through time (Massey & Jess, 1995). According to Steele (1981, p. 12), sense of place is the pattern of reactions that a setting stimulates for a person. It is the result of the interaction between features of the setting, both physical and social, and people's psychological responses toward them, i.e. their place experiences. Thus the nature and magnitude of sense of place may vary depending on the interactions between the condition of the physical setting, intensity of people's activities, and the quality of experiences and meanings thus derived from it, as well as the geographic, socio-cultural context, among which sense of place is fostered.

Jackson (1994) noted that, though some might believe that sense of place comes from our responses to features which are already there, something inherent to the place, he believed that "a sense of place is something that we ourselves create in the course of time. It is the result of habit or custom." (p. 151) Ryden (1993) agreed that "a place . . .takes in the meanings which people assign to that landscape through the process of living in it"(p. 37), thus "a sense of place can be acquired gradually and unconsciously through "inhabiting a landscape over time, becoming familiar with its physical properties, accruing a history within its confines." (p. 38) Walter (1988) emphasized that "the whole synthesis of located experience – including what we imagine as well as the sights, stories, feelings, and concepts – gives us the sense of a place" (p. 2). Tuan (1975) also stated that sense of place cannot be fostered through just passing, but

through long term association with the place. “To know a place well requires long residence and deep involvement” (p. 164). Tuan continued that passage of time itself does not guarantee a sense of place, if it does not ensure experience, as Hay (1998b) has argued that “contact with a place is necessary to maintain a sense of place, just as such contact is necessary to maintain other relationship” (p. 6).

In conceptualizing the nature of environmental experience, Ittelson, Frank, and O’Hanlon (1976, p. 201) proposed five “modes” of experiencing the environment: 1) environment as an external physical place, which denotes that the environment is perceived as something out there, detached from the subjects and existing independently of them; 2) environment as self, which implies the breaking down of the barriers between environment and self, and is characterized by a sense of belonging to and being part of the environment, and identification with the physical environment as well as other people in the environment, one’s experience of and actions in the environment; 3) environment as social system, which means that environment is experienced as autonomous social system or cultural network where the social interrelationships rather than physical settings dominate; 4) environment as emotional territory, which means that the direct affective impact of a situation is dominant to the extent that certain environment is experienced solely in terms of the emotions and associations that one feels; and 5) environment as setting for action, which means environment is experienced exclusively or primarily as a setting within which action takes place, and the environment is thus valued for its potential to carry out certain actions or meet certain goals. The authors emphasized that no single mode or combination of these modes of environmental experiences may constitute a true picture of the environment. They assumed that people’s goals and the actions undertaken to reach them might be important determinant factors of the modes. They believe that, “environmental experience is the continuing product of an active endeavor by the individual to create for himself a situation within which he can optimally function and achieve his own particular pattern of satisfaction”(p. 206).

To summarize, it is difficult to describe or analyze place without referring to space. The physicality and materiality of place form the bases of place, and give place its unique character that is explicit. However, place is far more than symbol of spatial location. As Cochrane (1987) has pointed out, place might be understood “less as a physical location than a deeply affective characterization crystallized from an individual's emotions, experience and cultural background” (p. 10). It is an entity interwoven with human activities, actions, and intentions. It is the meanings thus derived from place experiences during the processes of people-place interactions that endow place with existential significance. Meaning is the key factor that differentiate place from space. It is the meaning of a setting that matters to people who are aware of the significance of the place and who have formed a sense of place toward it. What characterizes sense of place is a “tendency to form strong emotional bonds with places” (Williams & Stewart, 1998, p. 19), either consciously or unconsciously. In other words, what constitutes the essence of sense of place is a deeply felt bonding with and attachment to place that motivates people to involve in place and encourages people to commit to and even sacrifice for place. The following section provides a detailed review on literature related to the discussion on the concept of place attachment that emphasis specifically the emotional bond between people and place.

2.2 Conceptualizing Place Attachment: An Interdisciplinary Review

2.2.1 From "Attached to People" to "Attached to Place"

The experience of and the need to form affective bond with other things permeates our daily life. It is represented in various forms, either it be positive or negative, pleasant or unpleasant, directed toward diverse objects, either person, material things or spatial settings, and operated in different geographic scales (Giuliani, 2003).

Research on influences of attachment in interpersonal relationship, such as the negative effects of maternal deprivation on children (Ainsworth, 1991), emphasized the importance of intimate emotional bonds as a basic characteristic of human beings. It thus provides the theoretical basis for the extrapolation that people may develop emotional bonding to or association with, i.e. attachment, to the surrounding environment within which they live in the process of people-place interactions, in a similar way through which people develop emotional bonding with other persons. This is reflected in Steel's (2000) analogy of interpersonal bonding to place attachment that, as he suggested, by substituting the word "person" for the word "place" in some of the theoretical points of place bonding/attachment, it becomes apparent that the dimensions of place bonding/attachment are parallel to those of interpersonal bonding and attachment.

Giuliani (2003) also identified several similarities of aspects typical of affective relationships between persons and between persons and places, such as the important psychological functions performed by these relationships in enhancing the well-being of individuals, the varying roles played by particular functions at different life stage, the long-lasting effect of the bond, the negative responses when facing changes, etc. However, Giuliani's differentiation of theory of interpersonal attachment and attachment to places, such as the evolutionary framework adopted by the former and the socio-cultural perspective dominant in the later, the different way of considering developmental aspects, and the definition strictness of attachment, suggests that place attachment is a distinct concept (pp. 159-160).

To some, the concept of place, as oppose to space, has already implied a strong emotional tie, either temporary or long lasting, between people and a particular physical location (Sime, 1986, p. 50). Relph (1976, Preface) thus argued that "distinctive and diverse places are manifestations of a deeply felt involvement with those places by the people who live in them", this association can be intense and important to the extent that "for many such a profound attachment to place is as necessary and significant as a close relationship with other people". It is a fundamental human need to be attached to a place, and it is through people's attachment that the significance of places as centres of human existence is manifested (Eyles, 1989).

2.2.2 Conceptualizing People-Place Bond

Place attachment is considered as a concept comprising interrelated and inseparable aspects of people-place relationships (Low & Altman, 1992). It has become the primary focus of a variety of research areas such as humanistic geography, social psychology, environmental psychology, urban sociology, and architecture. Different scientific traditions of different disciplines have led to varying emphases on the nature and representations of place attachment. The condition is

represented by a variety of analogous ideas and notions put forward by researchers to refer to the affective bonds with places, such as topophilia and geopiety (Tuan, 1974b, 1976), sense of place or rootedness (Tuan, 1980), biophilia (Ulrich, 1993; Wilson, 1993), place identity (Proshansky, Fabian, & Kaminoff, 1983), settlement identity (Feldman, 1990), community sentiment and identity (Hummon, 1992), etc.

Marc Fried's (1963) pioneering study on the psychological consequences of the forced relocation of the residents of a Boston urban slum, the West End, revealed an implicit however strong and positive emotional attachment between the residents and the neighborhood they lived in. The sorrow experiences expressed by the residents, as suggested by Fried, resemble the expression of grief when losing a beloved one. Fried attributed this loss to the interruption in individuals' sense of continuity due to the fragmentation of their spatial identity and group identity, and what associated with these two "cognitive" components are strong affective qualities. It was found that the residents' attachment to the neighborhood was associated more with their familiarity with the place than with their length of residence. To maintain the sense of continuity, Fried offered some suggestions to planners: 1) reducing the amount of drastic redevelopment that may lead to mass demolition of property and mass dislocation; 2) providing more opportunities for within-neighborhood movement; 3) planning new facilities that are assimilated to the functions of the old ones. Although widely acknowledged for its seminal significance, Fried's research was criticized by some for lacking of theoretical foundation and confusing attachment with satisfaction (Giuliani, 2003). Through their studies on people's responses toward burglaries, voluntary relocation, and natural disasters, Brown and Perkins (1992) also found that place disruptions, either via changes in places or place processes, may interrupt the emotional connections that bind people to their sociophysical environments. The cases cited in both Fried's study and Brown and Perkins' research may seem to be extreme examples of the consequences of radical social incidents through which people's emotional tie with the place they live in were made explicit during intense environmental changes.

Tuan (1974b) defined **topophilia** as "the affective bond between people and place or setting" (p. 4). It is "… a final stratum of emotion, a level of feeling which is inseparable from place...probably contributes most to separating the perspective of the insider from the outsider" (p. 67). In another essay, Tuan (1976) proposed **geopiety**, a term borrowed from John K. Wright but with different meaning, as a concept to cover a wide range of emotional bonds between man and nature, with "geo" denoting earth and nature vis-a-vis heaven, and soil, land, country, and nation, and "piety" denoting reverece and attachment to one's family and homeland, and to the gods who protect them. It was assumed to be the underlying ideal of the ecological doctrine that we should return to nature what we have extracted and the land ethos of conservationist such as Aldo Leopold (1970). Relph pointed out that the notions of reciprocity and caring, of gratitude and respect, that characterize geopiety are unfortunately uncommon in modern society.

Compared with Tuan's notions of topophilia and geopiety which are general in geographic terms, Wilson's (1993) notion of biophilia is more specifically centred around the bio-physical environment of in which human being live. Wilson defined **biophilia** as "the innately emotional affiliation of human beings to other living organisms" (p. 31), and he hypothesized that biophilia

has a deep evolutionary origion and this disposition has profound impact on environmental ethics that goes beyond the utilitarian perspective toward natural environment and embraces the protection and maintenance of biodiversity. Ulrich (1993) added that both the positive and negative affiliations with nature are dialectical complimentary components of the biophilia phenomenon. According to Ulrich, contact with nature that motivated by the biophilia proposition not only can influence people's liking/approach responses to nature, but can contribute to people's psychological restoration and thus facilitate their high-order cognitive functioning.

Gerson et al. (1977) concepturalized **neighborhood attachment** as "individuals' commitment to their neighborhood and neighbors" (p. 139), and is represented by people's social invovlement and subjective feeling. Through analyzing data from a national survey, They identified four out of seven types of neighborhood attachment to be salient, which are institutional tie – for example neighborhood involvement through church, school, or work; social activity – involvement with neighbors or local orgnizations; local intimates – presence of relatives or close friends within the neighborhood; and affective attachment – positive feelings toward the neighborhood and desire for residential stability. They also found that neighborhood attachment may be associated with people's life stage, and affected by the qualities of the community. However, they did not discuss the necessity of developing attachment as well as the impacts of attachment on people when it is challenged. Their proposed structural alternative model suggested that the neigborhood attachment might be the results of social and economic ties that limit the available alternatives.

Riger and Lavrakas' (1981) research was based on the hypothesis that a sense of belonging to the neighborhood is a prerequisite to foster a sense of community, which is crucial to the residents' mental well being. In their study, a series of question items that were assumed to reflect people's social, economic, and behavioral ties to their neighborhood were utilized to probe the concept of **community tie**. Two sub-dimensions were identified: Behavioral Rootedness, or physical attachment, which represents "the extend to which a person is settled or rooted in her/his neighborhood", and Social Bonding, or social attachment, which represents "the extend to which a person has formed social bonds with the neighborhood" (p. 59). They also found that rootedness was associated with age and social bonding is associated with presence or absence of children.

Feldman (1990) defined **settlement identity** as "patterns of conscious and unconscious ideas, feelings, beliefs, preferences, values, goals, and behavioral tendencies and skills that relate the identity of a person to a type of settlement, and provide dispositions for future engagement with that type of settlement" (p. 191), or a person's "professed identification of self with a type of settlement" (p. 198). Her point was that a person's experiences of psychological bonds with a specific locale may generalize to psychological bonds with that type of locale, and it is this generalized settlement identity that has sustained residentially mobile individuals to "maintain the order and predicability of residential experiences" and supported and reaffirmed their self-identity (p. 192). The findings derived from her empirial study confirmed that the people may form varing intensities of psychological bond with types of settlements, and this identification with a type of settlement may affect their evaluations of these settlements. However, the

cognitions, affects, and behavioral dispositions indicative of settlement identity were not discussed in Feldman's study (p. 224).

2.2.3 Convergence and Divergence in Place Attachment Studies

Although different approaches have been adopted by theorists to conceptualize people-place bond, it is generally acknowledged that place attachment is characterized by a positive emotional bond that develops between people and a specific place or a type of place (Moore & Graefe, 1994; Williams, et al., 1992). Shumaker and Hankin (1984, p. 59) noted that several consistent underlying assumptions across the research on this subject matter can be summarized as: 1) individuals can become attached to their sociophysical environments; 2) there are differences in levels of attachment across individuals, groups, and locales; 3) the strength of the attachment has important implications for both the individuals and their environments. Although some have pointed out that, in some circumstance the tie between people and place may become impediment and precludes people from adapting to new environment (Fried, 2000), it is acknowledged that the affective feeling we experience towards certain places and to the communities obviously has substantial implications to our everyday life, in that it may has "a strong positive effect in defining our identity, in filling our life with meaning, in enriching it with values, goals and significance" (Giuliani, 2003, pp. 135-136). Shumaker and Taylor (1983, p. 223) also noted that the multidimensional person-place bonding relationship represented by place attachment has implications for the attitudes and behaviors of individuals toward their socio-physical environments, and can help to predict and explain several outcome phenomena, such as commitment to local groups, psychological well-being, and physical health.

Regardless of the growing interests of place attachment reflected in academic writings, current research on place attachment is characterized by a lack of consensus on the theoretical foundation and a great deal of divergences on definition of core concepts (Hidalgo & Hernandez, 2001; Lalli, 1992; Stedman, 2002, 2003). As Shumaker and Hankin (1984) has noted in a special journal issue devoted to the discussion of attachment to place that, beyond general consensus on some underlying assumptions, "there is little overlap among theorists regarding the specific factors that lead a person to develop an attachment to place, how that attachment might be assessed, and its specific impacts on person, groups, and places" (p. 60). But some believe that place attachment research is still in the process of evolving. Low and Altman (1992) suggested that the development of place attachment research may also follows a common three-phase trajectory of many concepts in the social sciences. The first stage is characterized by a presumed consensus among scholars regarding the meaning, scope, and underlying dynamics of the concept. The second stage is characterized by an erosion of consensus, and scholars will investigate the phenomenon related to the original concept with greater rigor via developed taxonomies to examine its multidimensionality and explore the diversity of its meanings. The third stage will witness the "development of systematic theoretical positions and clearly delineated programs of research and application of knowledge to the solution of practical problems" (p. 3). Low and Altman believed that contemporary place attachment research is still situated in the second phase of this trajectory.

Patterson and Williams (2005), however, depicted a different picture and suggested an alternative perspective on how to comprehend the whole body of place research. They commented that some of the critiques of place research expressing concerns about lack of conceptual clarity and inadequate theoretical development are overstated and are not proper reflections of the degree of systematic development evident in the inter-disciplinary body of existing place-based research program. Patterson and Williams argued that place research should be perceived as "a broad domain of research informed by a variety of interdisciplinary research programs each reflecting different philosophical assumptions" (p. 365), rather than a single research program in itself. They proposed a framework (Figure 2. 3) to organize a diverse array of place-related research programs in a systematic way on the basis of common themes and core underlying assumptions through examining the "epistemological foundations of research traditions that transcends disciplinary boundaries". Patterson and Williams contended that only through understanding of the macrostructure of these varied research traditions and analysis of points of convergence and divergence in a pluralistic world view can the conceptual clarity and coherence across the body of place research be identified. Patterson and Williams believed that it is exactly this wider perspective of progression of a domain of research like place, rather than forcing standardized terminology or applying a single overarching theory across various research programs that might eliminate diversity in approach, that the third stage of research development proposed by Low and Altman (1992) actually implies (p. 371).

The following sections provide a review of the key literature within different research programs through examining their emphases on the nature, the origins, and the impacts of place attachment. Distinctions between different methodological orientations that are represented by a division between phenomenological and positivistic approaches are also discussed.

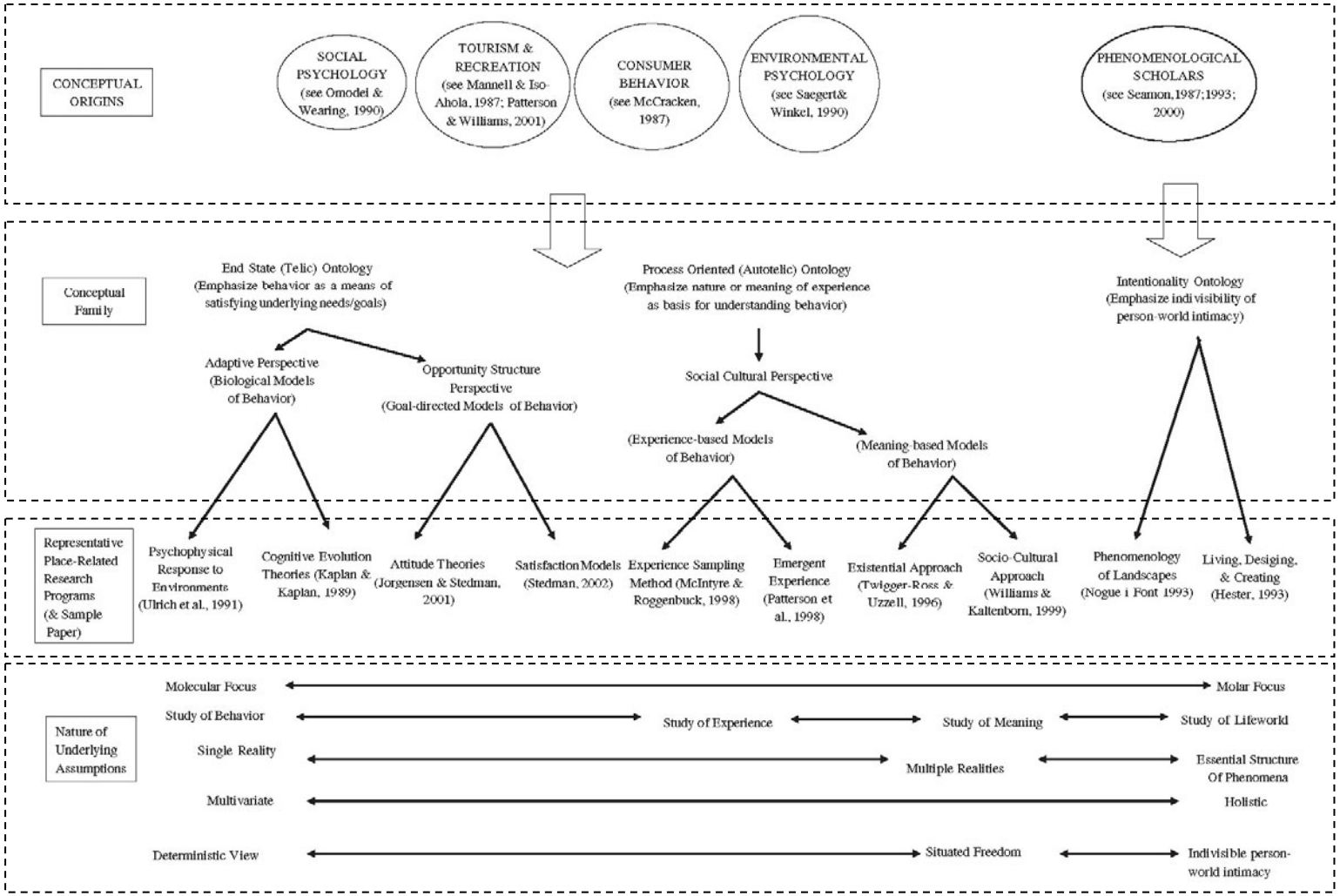


Figure 2. 3 A partial map of Research Programs on place organized according to research traditions

(Source: Patterson & Williams (2005, p. 366), dash-line frames are added by the author for the purpose of graphical clarity)

2.2.4 Nature of Place Attachment

Current research suggests that place attachment might have two distinct dimensions: place dependence and place identity, which encompass both the functional and the emotional/symbolic meanings people attribute to places (Kaltenborn, 1997; Moore & Graefe, 1994; Schreyer, Jacob, & White, 1981; Williams, et al., 1992). These two dimensions have received considerable attention and are widely acknowledged as the most salient and representative aspects regarding the nature of place attachment. Their validity and reliability have also been examined and scrutinized systematically in empirical studies in various research contexts.

Place Dependence

Place dependence concerns “how well a setting serves goal achievement given an existing range of alternatives” (Jorgensen & Stedman, 2001, p. 234). It was defined as “the subjective quality of the relationship between occupants and places” and “an occupant’s perceived strength of association between him or herself and specific places" (Stokols & Shumaker, 1981).

By referring to Thibaut and Kelly's (1986) comparison level/comparison level for alternatives model Stokols and Shumaker (1981) argued that place dependence is a form of affective feeling associated with the potential of a particular place to satisfy the needs and goals of an individual by comparing with past places, which is called comparison level (CL), and the assessment of how the current place compares with other currently available settings that may satisfy the same set of needs, that is, the comparison level of alternatives (CL_{alt}), which means that the level of place dependence is an outcome of a comparison process that involves an evaluation of current place vis-à-vis previous similar places as well as current place vis-à-vis current viable-alternative places on how well these places have fulfilled one’s needs (Shumaker & Taylor, 1983, p. 225). They suggested that factors, such as the quality of previous places, the number and range of needs met within the current place, the quality of the resources within the current setting, and the salience of needs met in the setting, may influence the CL and CL_{alt}, thereby determining the degree to which a person is dependent on a particular place include (Shumaker & Taylor, 1983, p. 225).

Shumaker and Taylor (1983, p. 225) suggested that Stokols and Shumaker’s (1981) model of place dependence bears similarity to Gerson’s (1977) structural alternative model, in that both of them consider attachment to place as a result of people’s evaluation of costs and benefits by comparing current place and available alternative places. However, Shumaker and Taylor (1983) continued that it is the factors that cause individuals to become dependent upon a particular place rather than a model of attachment that Stokols and Shumaker (1981) have proposed in their study. The difference between place dependence and attachment lies in, first, place dependence can be negative to the extent that a place limits the achievement of valued outcomes, and second, the “strength of connection” of the social actor to the setting may be based on specific behavioral goals rather than general affect (Jorgensen & Stedman, 2001, p. 234). That means a person may probably develop negative place experiences because current place, though better than previous one, failed to fulfill his needs and there are no current viable alternatives available as possible compensation (which can be represented as outcomes>CL>

CL_{alt}). Therefore, this person can been conceptualized as place dependent but possesses no positive affect toward the environment that is the core dimension implied in the concept of attachment (Shumaker & Taylor, 1983, pp. 225-226).

Place Identity

Norberg-Schulz (1980) argued that orientation and identification are both important psychological functions of place. He wrote: “To gain an existential foothold, man has to be able to *orientate* himself, he has to know where he is. But he also has to *identify* himself with the environment, that is he has to know *how* he is in a certain place” (p. 19). Norberg-Schulz pointed out that in modern society the practical function of orientation has over-emphasized and identification has been left to chance.

Place identity is a concept evolved from a group of researchers’ conceptualization of selected problems regarding the cognitive connections between the self and the physical environment. It derived from theories describing the development of individuals’ self-identity, however, embraced a wider scope of analysis that include both social aspects of self-identity and the settings where this development occurs (Proshansky, 1978; Proshansky, et al., 1983). Bachelard (cited in Buttimer, 1980, p. 167) also pointed out that, regarding the intimate relationship between place and personality, a *topoanalysis* – the exploration of self-identity through place – might provide more fruitful insight than psychoanalysis to understand oneself.

Proshansky et al. (1983) referred to place identity as "clusters of positively and negatively valenced cognitions of physical settings . . . [that] help to define who and of what value the person is both to himself and in terms of how he thinks others view him" (p. 74). It is represented by "those dimensions of the self that define the individual's personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals, and behavioral tendencies and skills relevant to this environment" (Proshansky, 1978, p. 155), and it is characterized as “a sub-structure of the self-identity of the person consisting of, broadly conceived, cognitions about the physical world in which the individual lives” (Proshansky, et al., 1983, p. 59). Therefore, the subjective sense of self is defined and expressed not simply by one's relationship to other people, but also by one's relationships to the various physical settings that define and structure day-to-day life (Proshansky, et al., 1983, p. 58), or in Cuba and Hummon’s words, place identity can be defined as “an interpretation of self that uses environmental meaning to symbolize or situate [personal] identity.” (p.548)

Place, the source of place identity and locals imbued with personal, social, and cultural meanings, provides a significant framework in which identity is constructed, maintained, and transformed (Cuba & Hummon, 1993, p. 112). The environment is not only a mediator in regulating social interaction but also a means of creating and sustaining one's self. In this sense the physical environment is important in itself for the individual (Korpela, 1989). Thus, the attachment feelings people experienced of place go beyond the usefulness of a particular place or setting for pursuing a particular activity (Proshansky, et al., 1983). Other than acting as a resource to fulfill our intentional behavioral or experiential goals, a place can also be perceived

as an essential part of one's self conceptualization, resulting in strong emotional ties to places (Kyle, Graefe, et al., 2003). Therefore, one of the primary functions of place is to engender a sense of belonging and identity (Sime, 1986, p. 56).

Regarding the formation of place identity, Ryden (1993) has emphasized the effects of sufficient familiarity and propinquity. He noted that "… part of the sentiment which people feel for places derives from the feeling of identification that they form with those places. We commonly and casually identify ourselves in terms of our geographical labels" (p. 39). Ryden (1993) continues, that "… through extensive interaction with a place, people may begin to define themselves in terms of their relationship with and residence in that place, to the extent that they cannot really express who they are without inevitably taking into account the setting that surrounds them as well" (p. 76), echoing what Norberg-Schulz (1980) has noted that "human identity presupposes the identity of place".

In terms of the function of place identity, Proshansky and Kaminoff (1980) noted that place identity serves several intrapersonal functions, such as expression, control, personalization, meaning, defense and reduction of anxiety. In short, it helps us structure our experiences with various physical environments. Cuba and Hummon (1993, p. 112) summarized that the functions of place identity are reflected in two broad aspects: 1) place identity as display, which refers to how people use places to communicate qualities of the self to self or other, and 2) place identity as affiliation, which refers to how people use places to forge a sense of attachment or home. In other words, places not only can act as means to differentiate the self from other or others, provide individual with opportunities to express and affirm their identity (Kyle, et al., 2005, p. 155), but also can help to catalyze emotional ties between self and significant locales.

Schreyer et al. (1981) argued from the perspective of recreation study that place attachment represents a user's valuing of a recreation setting that encompasses both functional and emotional/symbolic meanings. Functional meanings have to do with the opportunities the setting affords in terms of specific activity needs, whereas the emotional/symbolic level of meaning has to do with the importance a person attaches to the place because of what the setting symbolizes or stands for. Williams and Roggenbuck (1989) pointed out that these two aspects of meanings appear to be similar to the concept of place dependence and place identity respectively.

2.2.5 Sources of Place Attachment

Place attachment is an integrative concept of complex nature, whose origins might vary a lot (Low & Altman, 1992). Due to the complexity and diversity of place and place meanings, the emotional bond between people and place can be manifested in a variety of ways, including attachment to nature and the physical landscape, social life, culture, community, and history of places (Kaltenborn, 1997).

Factors Related to Physical Environment

As pointed out by Low and Altman (1992, p. 5), the word "place" in "place attachment" denotes the environmental settings to which people are emotionally and culturally attached to. The multiple properties of places – their typologies and functions, their scales or sizes and scopes,

tangible or symbolic, known and experienced versus unknown or not experienced – thus imply that place attachment may has diverse representations in relation to various spatial settings.

Many place attachment studies focused on dwelling place and especially the environment of home, neighborhood and community. For example, studies of attachment in community level (Feldman, 1990; Gerson, et al., 1977; Riger & Lavrakas, 1981), as cited before, have demonstrated how such locales provide a significant locus of sentiment and meaning for the dwellers. Kaltenborn's (1997) work revealed the complexity and diversity of the nature of place attachment and the salient contribution of the natural environment to this attachment. Kaltenbom found in a study of recreation homeowners in a mountain valley in Norway that the respondents expressed substantial levels of attachment to their recreational homes and the surrounding setting, and the nature of this attachment was diverse. Although the commonly mentioned place identity and place dependence dimension of place attachment was not supported by factor analysis, the three subdimensions identified, namely attachment to the area, attachment to the recreation home, and attachment to a historical aspect through long-term family connections, suggested that the multifaceted phenomenon of place attachment may attain different structure in different contexts. It was also found that natural environment was perceived to be more important than social life in recreational home and the cultural-historical aspects of the place regarding factors that may contribute to place attachment. Multiple regress analysis revealed that, although the general attachment scale was significantly associated with both the perceived importance of the family-social and nature-cultural aspects of the setting, the predictive power of the three sub-dimensions of place attachment on these two aspects varied - the family-social aspects being predicted by both attachment to recreation home and history and nature-cultural aspects being predicted by attachment to the area only.

Research also demonstrated that people's attachment can go beyond the immediate dwelling place and extend to a variety of places of different scale. Cuba and Hummon (1993) compared people's place identity, as expressed by their feeling of "at-home", across three different spatial ranges – dwelling, community, and region. Their results indicated that it is precisely toward the conventionally most-studied place (the neighborhood or community) that the least number of people feel attached. Similar result was reported in Hidalgo and Hernandez's (2001) study, in which they measured and compared urban dwellers' place attachment within three spatial ranges – house, neighborhood, and city. They found that to the respondents the neighborhood, which used to be considered the most important in the formation of bonds of attachment, is the one with the weakest level of attachment compared with the other two spatial ranges. They attributed this phenomenon to the decrease in activities carried out in neighborhood and the possibility of moving back to it.

Tuan (1974a) suggested that place has "spirit" which is believed to dwell in it, and "personality" which suggests uniqueness. The personality of a place is "a composition of natural endowment (the physique of the land) and the modifications wrought by successive generations of human beings" (p. 234) that can either command awe or evoke affection. Past research demonstrats that, other than typology and scale, the characteristics of the physical environment of a specific spatial setting are also important sources of attachment to that place. In a study of the

importance of recreational activities in people's connections with special places, Eisenhauer, et al. (2000) found that, in addition to family and friend connections and convenience/ownership, physical features are important reasons for recreationists to develop attachment to the public lands which were perceived by them as special. Statements from the respondents regarding the contributing characteristics of physical environment included sentimental expressions about the mystery or uniqueness of an area, the aesthetic and geological value of a place, and the natural quality of a specific place. Williams et al. (1992) also found that wildness area visitors who had a setting focus exhibited strong attachment to wilderness areas. Those who have chosen "I came here because I enjoy place itself" to indicate the reason for their visit have significantly higher mean place attachment and wildness attachment scores than do activity-focused and social-focused respondents.

Factors Related to Social Network

Tuan (1974a) wrote, "All places are small worlds: the sense of a world, however, may be called forth by art … as much as by the intangible net of human relations" (p. 245). Buttimer (1980) has pointed out that "personal and social associations with place-based networks of interaction and affiliation" are important to people's conceptualization of place (p. 167). Low and Altman (1992) also emphasized the important role of social relationship in the development of place attachment. They argued that "places are repositories and contexts within which interpersonal, community and cultural relationships occur, and it is to those social relationships, not just to place qua place, to which people are attached" (p. 7). Previous studies have revealed that local social involvements – not only those with friends, but also those involving kin, organizational memberships, etc. - are the most consistent and significant sources of sentimental ties to local places (Cuba & Hummon, 1993, p. 115).

In a study on community attachment, Kasarda and Janowitz (1974, p. 335) found empirical evidence to support that their hypothesized systematic model, which assumed individual's length of residence is the central factor of social bonds, is more appropriate than a linear-development model, which suggested increased population and density as the main factors. They observed that length of residence is positively associated with individual's local social involvements, such as local friendships, community sentiment, and participation in local affairs, that are crucial to the development of community attachment. Similar results were reported in Sampson's (1988) and Goudy's (1990) research. These findings are in line with a rather extreme perspective held by some that attachment to "home", though positively related to length of residence in that area, is primarily "concerned with the interaction of the individual with other people – rather than with his relationship to his physical environment", thus "place is essentially its people and that appearance or landscape are little more than a backdrop of relatively trivial importance" (Relph, 1976, p. 33).

Gerson et al. (1977) identified that, among the various forms of local involvement, voluntary ties (neighboring, local friends) are more effective in promoting feelings of attachment than functional ties (institutions, kin). The results of a naitonal survey revealed that people who were more socially involved in a neighborhood had generally higher level of affective attachment, which was indicated by being happy with the neighborhood and reluctant to leave it, than did those

relatively unattached people.

Mesch and Manor (1998) found that the respondents' social investments within their neighborhood influenced their sentiments toward the neighborhood, which is reflected by the positive correlation between the number of close friends of subjects living within the neighborhood and their level of neighborhood attachment, which was measured by the items of "proud to living in the neighborhood", "sorry to move out", and "have planes to move out in the future".

Hidalgo and Hernandez (2001) also found in their study that the respondents' social attachment, i.e. attachment to the people who live in that place, is significantly stronger than their attachment to the physical environment of the place along three spatial context: houses, neighborhoods, and cities.

The aforementioned Eisenhauer, et al.'s (2000) study has revealed that "family/friend related reasons" were frequently cited by respondents as contributing to their attachment to the public lands which they consider special. These social-relationship-related responses covers interactions at these locales among family or friends, family activities, family traditions or heritage, family homesteading, and memories associated with these people at these places.

Factors Related to Socio-Cultural Context

Past research has also explored the sociocultural origion and dynamics of place attachment, such as the influences of social norms and idealogies, cultural and public meanings and symbols, and ritual performances (Low & Altman, 1992). It was suggested that people's attachment to a particular place is actually a reflection of their affective bonds with ideas, people, psychological states, past experiences, and culture embedded in that place. Thus, sometimes, it is the sociocultural context, rather than the place qua place as repository of a variety of life experiences, that forms the focus of attachment (Low & Altman, 1992, p. 10).

Low (1992) argued that individualistic feelings toward a place are embedded in a cultural milieu, therefore, "there is a transformation of the experience of a space or piece of land into culturally meaningful and shared symbols, that is, place" (p. 166). Accordingly, Low proposed a typology of cultural place attachment to describe the various natures of the symbolic linkage between people and place. These somewhat overlapping types range from 1) genealogical linkage to the land via history or family linkage; 2) linkage unveiled when when suffering from community disruption; 3) economic linkage in the form of ownership, inheretance, and politics; 4) cosmological linkage through religious, spiritural, or mythological relationship; 5) linkage menifested through religious, celebratory, or cultural events; to 6) narrative linkage built via storytelling and place naming. Low thus urged that a cultural dimension of place attachment should be integrated into environment-behavior and environmental design research so that key aspects of the environment that are most important for attachment can be identified.

In a series of research, Mazumdar and Mazumdar explored specifically the role that religion plays in place attachment, especially attachment to sacred spaces. In an early study, Mazumdar

and Mazumdar (1993) differentiated secular place attachment and religion related sacred place attachment, to which a typology is proposed that includes attachment to natural landscapes, to sacred cities, to religious architecture, and to homes. Through detailed analysis of Hindu house, they found that "home as sacred space evokes strong affective ties of emotional commitment and connectedness, of a sense of history, belonging and rootedness" (p. 237). They also found that this emotional tie, which is forged through sacred place making, repeated ritual experiences and sacred acts participation, and religious learning within the sacred space, enhances people's spiritual self and religious self, two important components of self-identity. They pointed out that the bonds between people and place formed via sacred acts of religion are missing in modern functional architecture which usually ignors the sacred components. Through elaborating on a model of religious place attachment with reference to three representative reglions, Mazumdar and Mazumdar (2004) further illustrated in a later study the reciprocal relationship between place and religion, which, as suggested, is an important component of attachment people may feel to particular places. They also emphasized that, other than the physical characteristics of place that is made sacred, religious socializatoin and experiences are also important contributors to religious place attachment (Figure 2. 4).

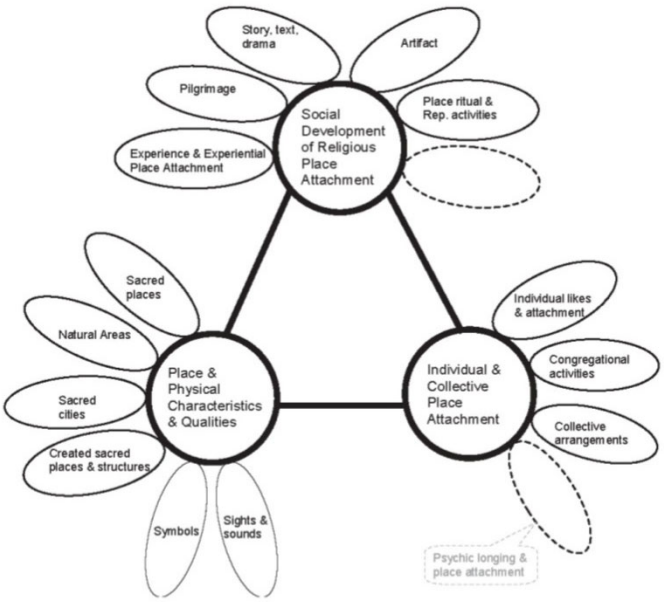


Figure 2. 4 A model of religious place attachment

(Source: Mazumdar, 2004, p. 388)

Factors Related to Place-based Experience

Tuan (1974a) noted that repeated experience is the means through which affective bond reaches beyond human beings to place (p. 242). Tuan (1977) also pointed out that though attachment to place might be a function of time, "the quality and intensity of experience matters more than simple duration" (p. 198). Past research has demonstrated that it is through interactions between people and place that attachment or the feeling of bonding is developed. As Kaltenborn (1998) emphasized, "sense of place is created through the interaction of people and places, and the

experience of place cannot be separated from the specific situation and the behaviour occurring in the place" (p. 186)[5].

Feldman (1990) believed that the psychological bonds with home places are developed "through long-term, focused involvement in a residential setting. Through the purposeful and satisfying concentration of the multiple routines of daily life in a geographic location, the residential environ is distinguished from its surroundings and imbued with positive affect. The home environ becomes a unique place of familiar, known, and predictable activities, people, and physical elements; a focal point of one's experiential space" (p. 188). Thus, continuous interactions between people and place are regarded by some as prerequisites of the development of place attachment.

Milligan's (1998) reseach, which explored from symbolic interactionist's perspective the emotional bonds between a coffee house and its emploryees and college students, emphasied the important role of people-place interaction, especially the process of cumulative experiences, in the process of the development of place attachment. The findings revealed that the students' interactions with the setting and others within the setting fostered their emotional bonds with the coffee place. Based on interview with students, Milligan concepturalized place attachment as consisting of two components: the interactional past ("memories"), which was defined as the past experiences associated with a site, and the interactional potential ("expectations"), which was defined as the future experiences imagined or anticipated to be possible in a site. Milligan aruged that it is the "history tied to the experiences that have occurred within it (the site)" and "the activities that are perceived as able to happen within it" (p. 9) that endow the site with meanings, thus trasnsform it from a space to a known place and, further, a place to which an individual is emotionally bonded.

Studies focusing on relationship between leisure activity and attachment to recreation setting have provided a good many evidences to support that the meanings individuals ascribe to spatial environment are largely impacted by the activities conducted within these settings and the social relationships involved in these activities. Not only intensity and quality of current recreational activities but also previous place-related experiences have significant impacts on attachment. For example, Williams et al. (1992) found that individuals with more previous visiting experiences expressed higher degree of attachment to the wildness recreation site (p. 37). Similar finding was also reported in Kyle et al.'s (2004) study of Appalachian Trail hikers which supports the notion that previous activity experience may contribute to the development of setting attachment. Vorkinn & Riese (2001) also observed that activity related variables, such as use intensity (number of days used last year), use experience (number of years used), and level of engagement in recreational activities, were significantly associated with place attachment. In their study, these variables explained between 56% and 64% of the variance in the strength of attachment in four out of the five study areas.

Different oppinions were also identified in literature. Although Eisenhauer et al.'s (2000) found

[5] Although Kaltenborn's (1998) sense-of-place scale was adapted from Shamai's (1991) work, the operational items he used for measurement resemble those utilized in many other attachment studies, thus his study is still consider here an empirical investigation on place attachment.

that recreationists' interaction with specific natural settings and other people within these settings may foster the development of emotional attachment to the setting, they observed that these users' participation in a variety of activities may generate similar meanings of their special place experiences. Thus, they suggested that the reasons for feeling emotional attachment to places might be largely independent of the activities people do there.

The relationship between place attachment and environmental experience was also explored by Ryan (1997, 2005) in the context of three urban natual areas through surveying a wide range of people, including local residents, visitors, volunteers, and park staff, based on the understanding that as a major source of attachment, environmental experience may take a variety of forms, ranging from direct participation to indirect involvement. These participants were categoriezed along a gradient into seven groups based on their type of experience and intensity of experience. Analysis revealed significant differences between the seven levels of environmental involvment regarding different measures of place attachment: a place-specific attachment, i.e. feeling attached to a particular park or natural area, was generall held by neighbors and recreational users, whereas a conceptural attachment, i.e. feeling attached to a type of landscape, was held by volunteers, staff, and those with more natural-area knowledge. Besides, sustitutability of place was regarded as more acceptable by the later than the former group. Ryan also found that these different patterns of environmental experience were associated with diffferent attitudes towards environmental management. Ryan thus called for a better understanding of the various experiential sources of people's attachment to place and the adoptation of multiple perspectives in park planning and management that go beyond traditional park users.

Factors Related to Socio-demographic Characteristics

Reseach has suggested that attachment with local neighborhood or community may be positively associated with age (Goudy, 1990; Sampson, 1988). Research also indicated that residential place may play increasingly important role in place identification for the elderly (Rowles, 1983). Keller (1968, p. 115) has pointed out that length of residence and age of residence may strengthen attachment to an area. Compare with young and newer residents, older and long-term residents may express more satisfaction toward their neighborhood, and it is the aged that suffer the most from disruption to ties to local facilities during urban renewal. Taylor and Townsend (1976) found in a study of lcoal residents' sense of place that those who are 65 or older had "the greatest affection for the area where they live" (p. 139). They also found that socio-economic status and length of residence are the prime determinants of local attachment. Cuba and Hummon (1993) reported that, compared to their younger counterparts, senior respondents were more likely to locate their senes of self in the dwelling. Hidalgo and Hernandez (2001) discovered in their study that age was positively associated people's attachment level across three spatial ranges: house, neighborhood, and city, though which type of attachment is most salient may vary depending on the life stage. In Jorgensen and Stedman's (2006) study, age was found having a weak, indirect effect on place identity via its impact on perception of lake importance but the effects of age on place dependence and place attachment were insignificant.

Research on community attachment demonstrated that emotional bonding might be positively associated with length of residence in that long-term residence may help imbueing landscape

with meanings via life experiences and at the same time, such residence may nourish ties to friends, kin, and community organizations (Cuba & Hummon, 1993; Guest & Lee, 1983). In their reevaluaiton of a national social survey, Janowitz and Kasarda (1974) found that length of residence was closely linked both to the feeling of belongingness and to the sorrow at moving out the community, two indicator used to measure community attachment. Willaims et al. (1995) also found that length of residency is more strongly correlated with community sentiments than with either community identity or regional identity. McCool and Matin (1994) observed that respondents' length of residence is positively associated with their level of attachment to that community, which is measured by their responses to two statements: "If I had to move away from my community, I would be very sorry to leave" and "I'd rather live in the town where I live now than anywhere else". Lalli (1992) also identified a consistent increase of people's identification with the urban area they live over time. Among the five subscales designed to measure 'urban identity', the 'general attachment' scale is highly sensitive to length of residence, indicating that 'general attachment', which was defined as "a general sense of being at home at town", develops in a relatively long period.

However, Gerson et al. (1977) has pointed out that length of residence may not be a sufficient factor of local attachment. They found in their study that why residents who have lived in their neighborhood for longer time tended to express higher level of happiness with their places and were reluctant to move was due to their social connection to the neighborhood. Thus, as they augued, long term residence alone may not gaurantee development of attachment if it doesn't enhance local social involvement. Harris et al. (1996) also commented that not all types of attachment may be associated with length of residence and that "the tendency to equate attachment with more permanent residences may have more to do with our cultural bias toward home ownership than with reality." (p. 297)

Fried (1963) found in his seminal work on residents' responses to forced relocation that "the greater the area of the West End which was known, the more likely there is to be a severe grief response." (p. 155) Thus, they concluded that "the wider an individual's familiarity with the local area, the greater his commitment to the locality" (p. 156) and influence of familiarity may even outweight that of the length of residence. Similar findings were reported by Lalli (1992), who found that residents who were born in the local area had expressed greater attachment to their city then those non-native residents. However, Stokols, Shumaker, and Martinez (1983) argued from another perspective that familiarity will not always lead to attachment, if people are not satisfied with their current living environment and are constrained to seek for alternatives. It is argued in this study that familiarity is the results of frequent experience, and is associated with specific parts of the place, thus can not be investigated in general terms as most past research did, thus a global familiarity index may not be an appropriate measure.

Differences of attachment were also identified between individuals and groups. In a study conducted in Southern Norway, Kaltenborn and Williams (2002) found that both local residents and tourists reported a relatively high level of attachment to the region they live in as a place, which is characterized by a wildness-type national park and a historic mining town recognized as a World Heritage Site of diverse agricultural landscape, and both valued the natural and social

attributes of that area. However, local residents generally reported higher level of attachment to the local national park and the adjacent region as a unique place than tourists to that area. They also found that the residents who had only lived in that area considered the social and local cultural historic aspects of the environment to be more important for their attachment to the national park than those who had been living outside of that area. Kaltenborn admitted that, although residence and experience of use history had limited effects on the nature of attachment as well as attitudes toward management priorities among both locals and visitors, differences between residents and tourist appeared to be small compared to within-group difference across levels of attachment, thus support the notion that place attachment may relate more to environmental factors than to demographic characteristics.

Some has investigated the interaction between place attachment that persists in group level and that in individual level. Sampson (1988) reported evidence from a large national survey in Britain of the existence of a strong local community bond on both macro and micro level. On the macro level, collective attachment refers to the level of sentiment and attachment to community which was defined as the percentage of residents who reported they would be “very sorry” to leave the local area. On the micro level, individual attachment to community was measured by response to the question: “How would you feel about moving away from this area?” Sampson found that collective attachment had a significant and substantial contextual effect on individual’s attachment to the community, suggesting that residents of areas where the average level of attachment is high also reported stronger sentiment for the community. Sampson thus argued that individuals are influenced not just by their own characteristics (e.g., length of residence), but also by those of others in the community. Sampson’s analysis also revealed that both length of residence and local friendships significantly increased attachment to the community.

2.2.6 Impacts of Place Attachment

Research has demonstrated that people’s attachment level will have substantial impacts on their attitudes regarding how the environment should be managed and their subsequent behaviors and actions to be taken. Past research also suggests that environmental disruptions within valued settings may result in raised level of place consciousness of individuals and yield negative psychological outcomes (Kyle, Graefe, Manning, et al., 2004b, p. 217).

Place attachment among different groups of people may be results of various influences and may imply different perspectives and opinions concerning the environment of a place. Thus, some suggested that investigating emotional attachment should be incorporated in natural resource and public land management as an important approach to understand what meanings people ascribe to the environment of a place and how various environmental strategies may compromise or enhance the bonds between people and place (Eisenhauer, et al., 2000; Williams & Stewart, 1998). For example, Williams et al. (1992) found higher place attachment is associated with sensitivity to ecological impacts, indicating that place-attached persons are more likely to consider ecological conditions as crucial in defining their wildness experience. They also observed that attached visitors may be sensitive to signs of environmental impacts such as litter and vegetation loss. Williams et al.’s (1995) research revealed that highly attached residents, as measured by regional identity, tended to be more supportive of local tourism

development than did unattached residents, a finding similar to that reported by McCool and Martin (1994) that attached residents who support tourism may be express stronger tie to the regional character of the landscape than to the community, as the later focus on local social network.

Guest and Lee (1983) found that compared with evaluation, which is indicated by level of satisfaction to the housing environment, sentimental attachment to local community exerts independent and more impressive effects on such activities as moving propensity and political action. Sentiment was found to have evident influences on both thoughts about moving and willingness to stay in that area. The higher the degree of sentiment one has, the more likely he/she will act on problems confronting the community.

In a study carried out in the Svalbard archipelago in the Norwegian high Arctic, Kaltenborn (1998) reported generally high degree of sense of place among local residents and a positive correlation between respondents' sense of place and their reaction to environmental impacts and their commitment to solve environmental problems. Kaltenborn thus suggested that systematic investigation of people's sense of place can provide useful information in environmental impact assessment through revealing the diverse place meanings associated with the environment. In a later study, Kaltenborn and Williams (2002) found that both the residents and tourists' attachment to that area had significant effects on their attitudes toward environmental management priorities. For both groups, level of attachment was positively associated with perceived importance of each of the potential management objectives.

Vorkinn and Rises (2001) found that, compared with other socio-demographic variables, local residents' attachment to the area that might be affected by a hydropower development was a much more significant predictor for their attitudes toward the proposal. They thus suggested that, in studies of public attitudes and responses to environmental issues related to specific sites, place attachment should be taken into consideration as an important factor.

Kyle et al. (2003) examined the moderating role of place attachment (i.e., place identity and place dependence) between recreationists' attitudes toward the site's fee program and visitors' support for spending revenue generated by the fee program in the areas of facilities and service development, environmental protection, and environmental education. They found that only place identity was such a salient moderator in that as place identity increased and recreationists' attitudes toward the fee program became more positive, support for spending fee revenue also increased. Place dependence only affected spending support for environmental education significantly. Kyle et al. argued that it is because that place identity is more pertinent to recreationists' value-relevant involvement with the recreation setting.

Kyle et al.'s (2004) research found that trail hikers' attachment to recreation setting was related to a variety of factors. These factors include personal characteristics, visit motivations, setting motivations, evaluation of setting conditions and evaluation of setting management actions, setting use and activity experience, and activity involvement. Using cluster analysis, Kyle et al. grouped respondents into three clusters based on their attachment level. The high-attached

users were mainly composed of males of middle age, and were most experienced and involved users. They visited the site mainly because of its well-known reputation. They preferred solitude but did not refuse socializing. They were most critical of the setting qualities and expressed strong support for restrictive management actions. The medium-attached users contained a large proportion of younger males who were less experienced and involved with hiking. Their motivation to visit was mainly the activities. They also quite concerned the setting conditions but were less particular regarding management actions and restrictions related to their activities. The low-attached users included younger females, who were the least experienced and involved users. Their visits were motivated by social and activity related reasons, and they were the least discerning group regarding quality evaluation and opinions toward management issues. Based on these findings, Kyle et al. concluded that it would not be appropriate to apply homogenous management strategies which fail to take into consideration the differences between attachment groups of different motivations, experiences, and preferences.

The influence of people attachment to local landscapes on their attitudes towards conservation planning strategies was explored by Walker and Ryan (2008) in the context of rural area. Through a survey utilizing both photo and written questionnaires, they found that those who indicated a higher level of attachment to the rural landscapes expressed significantly stronger support for conservation, and so did those who have a finder understanding of the representative landscape elements of the rural character. They also found that both levels of attachment and perceptions toward negative local environmental changes were positively related to people's willingness to be involved in preservation strategies. They thus argued that a better understanding of people's place attachment and the contributing landscape characteristics will facilitate planners and other professionals' work in determining priorities for conservation in the rural landscape.

2.2.7 Measuring Place Attachment

One of the key debates among current place literature concerns whether place attachment and place related concepts can be operationalized as measurable constructs? This question is important because, first, it is relevant to the basic understanding of the nature of the concept of place, and second, it pertains to the validity of analyzing the relationship between place attachment and other constructs via hypotheses testing in a systematic, quantitative fashion. With regard to this question, some have observed that the implementation of methods of analysis in current place attachment research is characterized by a division between positivistic approaches, which are represented by quantitative analysis, and non-positivistic approaches, which are represented by phenomenological analysis (Jorgensen & Stedman, 2001; Lalli, 1992; Mazumdar, 2005; Shamai, 1991; Stedman, 2000). Stedman (2002) commented on the paradoxical status quo that, on the one hand, interesting notions and statements that sounds like testable hypotheses were proposed by non-positivistic approaches, however, many of them were not tested as such; on the other hand, systematic analysis was conducted via positivistic approaches, however, many of them failed to engage important theoretical tenets (p. 562). This section reviews literature related to both approaches and their underlying theoretical thinking.

Critique from Non-Positivistic Perspective

Non-positivistic or qualitative research tends to, as suggested by some, "remove the importance

of and focus on concerns regarding generalizability, nature and size of sample, uniqueness of subject, and others" (Mazumdar, 2005, p. 92), as is epitomized by phenomenological approach, which concerns the analysis of the intentional interaction of person and environment (Lalli, 1992, p. 286). Generally speaking, phenomenology as a method attempts to bring back subject-matter to original experiences by exploring the things and events of daily experiences and emphasizes subjective meanings and intuitive descriptions of the world (Fishwick & Vining, 1992, p. 58). Phenomenology-oriented approaches tend to object or avoid testable hypotheses about the nature of place as that may compromise the integrity of the concept of place by dissecting it into component parts or cause-effect relationships in a non-holistic way (Stedman, 2002, p. 562).

According to Schneider (1986), the core of phenomenological approach is "to treat the 'person-in-environment' complex as an indissoluble unit, refusing to dichotomize it into a separate organism and a separate environment described in physical terms" (p. 205, also cited in Lalli, 1992, p. 286). In line with this perspective, Relph (1976) argued that place "… is not just a formal concept awaiting a precise definition" (p. 4). Thus the clarification of the concept of place "… cannot be achieved by imposing precise but arbitrary definitions, but must be sought by examining the links between place and the phenomenological foundations of geography – those direct experiences of the world …" (p. 4). For Relph, "places are particular settings with their own history and aesthetic properties, that have personal and communal significances, and which elude measurement" (Relph, 1978, p. 237). Norberg-Schulz (1996b) also agreed regarding the phenomenological nature of place. He noted that "a place is … a qualitative, 'total' phenomenon, which we cannot reduce to any of its properties, such as spatial relationships, without losing its concrete nature out of sight" (p. 414). Norberg-Schulz argued that "being qualitative totalities of a complex nature, places cannot be described by means of analytic, 'scientific' concepts" (p. 415), because the abstraction principle of science can only help to obtain neutral, "objective" knowledge, leaving the every-day world, "which ought to be the real concern of man in general and planners and architects in particular", ignored. It is based on this perspective that Norberg-Schulz embraced phenomenology as an approach to "return to things", as opposed to abstractions and mental construction. Seamon (1987) pointed out more specifically that superficial treatment of the underlying phenomenon of place by operationalizing place-related concepts into constructs such as place identity might eliminate the "phenomenological essence of place as a psycho-social-environmental whole larger than the sum of its parts" (p. 20).

However, some concern the phenomenological approach used by some humanistic geographers as "it is not always easy to draw a distinction or know where there are consistencies, between the views of phenomenologist and the people referred to" (Sime, 1986, pp. 54-55). Others have commented on the disadvantages of the two representatives of non-positivistic approaches: the descriptive approach seems to be lacking in systematic analysis, and their conclusions are too specific to be generalized from one place to any other, whereas in the philosophically oriented discussions terms defining key concepts tend to be used in a loose and sometimes misleading way (Shamai, 1991, p. 348). It is based on these critiques on non-positivistic approaches that some scholars have turned to quantitative research methods in an attempt to achieve better understanding of the nature of place attachment and place-related constructs.

Positivistic Approaches

The second stage of development of place attachment research, as suggested by Low and Altman (1992), requires more precise definitions and systematic examinations to explore the diversity of the meanings embedded in this complex and multifaceted concept. Positivistic approaches which are characterized by researcher-defined variables, quantitative methods, and traditional hypothesis testing (Jorgensen & Stedman, 2001, p. 234), exemplify such attempts to utilize quantitative methods to achieve better measurement of place concepts. Regarding the rationale for quantitative measurement, Kaltenborn (1998) argued that the validity of constructing empirical scale to measure phenomena such as sense of place in a quantitative way lies in that "almost any collection of individual experiences can be said to have certain common traits or structures across individuals and groups" (p. 187).

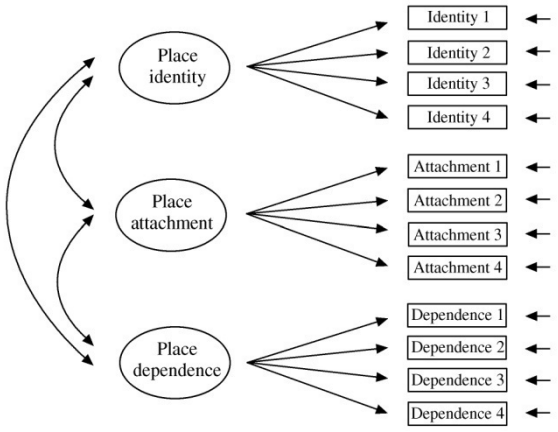
- Unidimensional Approaches

Some conceive the phenomenon of people-place bond as unidimensional, and propose a single variable or a global index as indicator, assuming it measures a single factor without considering the subdimensions underlying its inner structure (Shamai, 1991). For example, three sub-elements, i. e. existence, affiliations, and locus, were proposed by Cuba and Hummon (1993) as measures of 'place identity', which is defined as expression of 'at homeness'. However, responses to these three elements were operationalized in dichotomous form, leaving respondents' strength of the feelings toward a place unmeasured. In contrast, Hay (1998b) developed a composite variable 'intensity of sense of place' to measure respondents' intensity of sense of place by combining their reported attachment level, importance of ancestry, feelings of being an insider, and their motivation to remain in the setting. The scale proved to have good reliability (alpha=0.70). However, Hay did not go further to use alternative methods, such as exploratory factor analysis, to probe the scale's dimensionality.

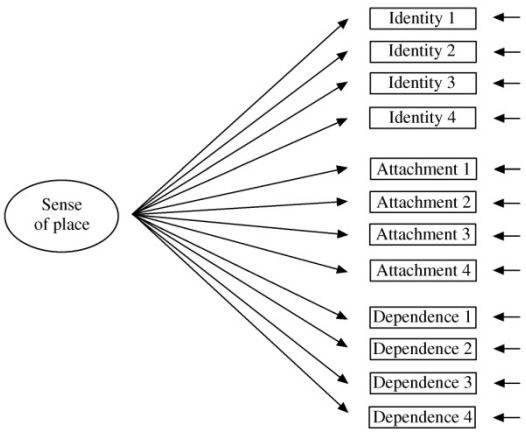
McAndrew (1998) utilized 16 statements to measure 'rootedness', a term equated with the concept of place attachment. Factor analysis revealed that ten out of the 16 items were found loaded on two subdimensions, 'Desire for Change' and "Home/Family Satisfaction', and this two-factor solution was replicated on an independent group of sample. However, the results of reliability test of the two factors were not consistent across the two groups and the correlation between them was significantly negative for the second group. McAndrew thus concluded that these two factors may be situated at "opposite ends of the same dimension" (p. 415), suggesting a single place dimension at the theoretical level.

Some theorized place attachment as a unidimensional construct and treated it, alongside place identity and place dependence, as a component of sense of place. For example, structural equation modeling procedures were utilized by Jorgensen and Stedman (2001) to compare five measurement models hypothesized as dimensional structure of sense of place in reference to attitude theory (Figure 2. 5). Place attachment was conceived as reflecting the affective components of sense of place as an attitudinal construct, and place identity the cognitive component, place dependence the conative component. Therefore, in these models place attachment was proposed as one of the dimensions of sense of place in the same hierarchy with

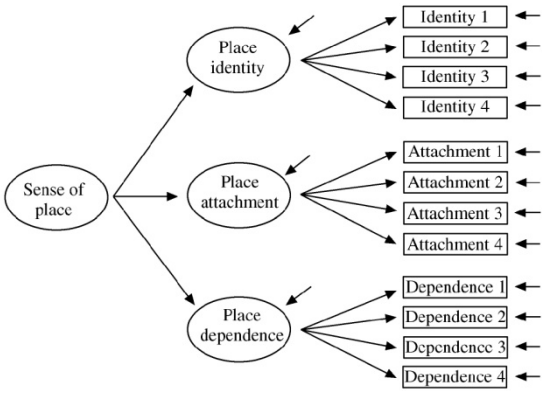
place identity and dependence dimensions, rather than as a higher order concept. Only the G+Group and the Correlated Uniqueness model showed acceptable fit, whereas the Unidimensional model showed the worst fit, indicating that multidimensional models with sense of place acting as an overarching concept provide better explanations of the overall variance than the three subdimensions. Further analysis also revealed that attachment appeared to be redundant dimension in the presence of sense of place. However, some concerned that the superiority of this model was only marginal and more empirical evidences are needed to support this factorial solution (Kyle, et al., 2005, p. 156).



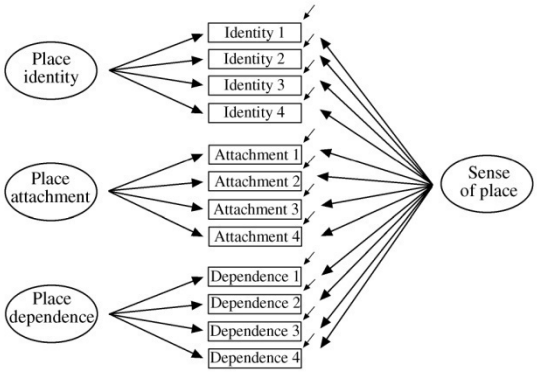
A: Tripartite (Three-Factor) Model



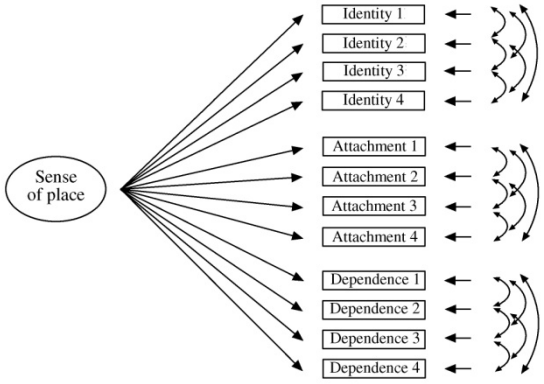
B: Unidimensional (One-Factor) Model



C: Higher-Order Model



D: G+Group Factor Model



E: Correlated Uniqueness Model

Figure 2. 5 Sense of Place Models

(Source: Jorgensen & Stedman, 2001, p. 238-240)

In a later study, Stedman (2002) proposed a model of sense of place with reference to social psychology. Symbolic meanings and evaluative beliefs were conceived as people's cognition toward a place, place satisfaction as attitude, and place attachment as identity. To empirically examine the behavioral implications of these components of sense of place, place attachment was conceptualized by Stedman as a unidimensional construct, which denotes personal

identification with a setting and was measured by a series of items adopted from previous research (Jorgensen & Stedman, 2001; Moore & Graefe, 1994; Williams, et al., 1992). Only one factor was revealed from factor analysis of the attachment items used, therefore the unidimensional conceptualization of place attachment was supported.

Using the sense of place model developed in an early study (Jorgensen & Stedman, 2001), in which place attachment was treated as a subdimension as place identity and place dependence, c (2006) further examined similarities and differences of variations in the relationships between the three subdimensions and other hypothesized predictor variables through path analysis with the help of structural equation modeling program (Figure 2. 6). After post hoc adjustment, this model demonstrated acceptable fit with the data. The results showed that some of the predictive variables and mediator variables had different relationship with the place dimensions, thus provide further support for the multidimensional approach of sense of place.

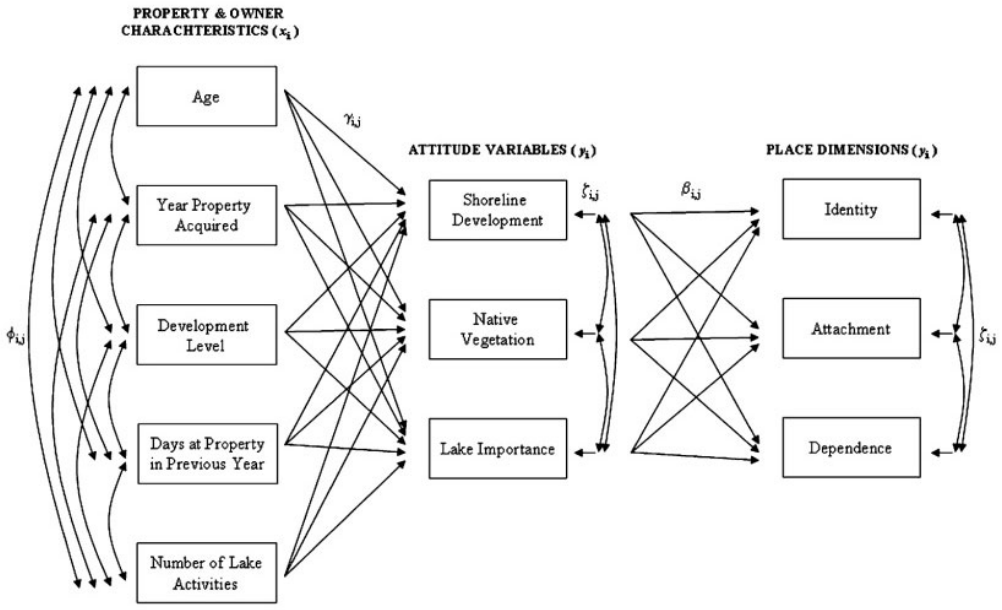


Figure 2. 6 Relationships between predictors and place dimensions

(Source: Jorgensen & Stedman, 2006, p. 320)

- Multidimensional Approaches

Initial attempts to measure place attachment as a multidimensional concept were conducted in exploratory manner in that measurement items were selected in a more or less intuitive way. For instance, Taylor et al. (1985) utilized 8 items as indicators of attachment to place. Principle components analysis revealed two dimensions: 1) a Rooted and Involvement dimension, which included items to indicate home ownership, gardening activity, shared organizational membership, and ability to recall neighbors' names, that reflect people's correlated rootedness and local involvement; and 2) a Local Acquaintanceship dimension, which included items to indicate acquaintance with neighbors, perceived similarity with neighbors, and length of residence merged into another factor, that reflect people's local social ties. They found that in the same factor analysis, a clear territorial dimension emerged with no items used to measure attachment, indicating that attachment place is discriminable from closely related person-place

concept such as territoriality. They also found through hierarchical multiple regression analysis that demographic variables, block level racial diversity, neighborhood social status, and perceived problems all contributed to level of Rooted and Involvement dimension, whereas only education level and block level racial diversity were significantly associated with Local Acquaintanceship dimension.

In contrast, Williams and his colleagues have conducted a series of studies to theorize and examine the dimensionality of place attachment in a systematic and rigorous way via quantitative analysis. In line with Schreyer et al. (1981), Stock and Shumaker (1981), and Proshansky et al. (1983), Williams and Roggenbuck (1989) conceptualized people's attachment to recreation setting as having two origins: one is resource dependence, which addresses the functional importance of the recreation setting; the other is resource identity, which indicates the degree of emotional or symbolic meaning assigned to a place. 11 resource dependence and 16 resource identity items were proposed in a pilot study and were evaluated among 129 college students. Factor analysis confirmed their hypothesized two dimensions of attachment, with an additional factor involving some negative appraisals of the setting. Williams et al. thus concluded that the bonding relationship between people and recreation setting is more than just a functional one. 13 out of the 27 place attachment items from Williams and Roggenbuck's (1989) study were adopted in a later study of attachment in wildness context (Williams, et al., 1992). However, responses to these 13 items were aggregated to form a single Place Attachment scale for later analysis, leaving the relationship between the two subdimensions and other variables unexplored. In another study focusing on developing a scale to tap the dimensionality of place attachment across four groups of respodents, Williams et al. (1995) found through factor analysis that place dependence may be distinguished from place identity as a form of attachment, and place identity may contains subcomponents related to activity involvement. To advance the understanding of the emotional and symbolic relationship between people and natural resources, Williams and Vaske (2003) examined in a systematic and rigorous manner the validity and generalizability of the hypothesized quantitative measures of attachment with seven sets of data gathered from a series of place attachment studies. Through confirmatory factor analysis via structural equation modeling, they found that the two-dimensional model (place identity and place dependence) was significantly better than the uni-dimensional model of place attachment across all seven sets of data. Patterns of factor loadings and reliability test provided further support for the hypothesized two-dimensional structure of place attachment. Results of ANOVA analysis also suggested a good convergent validity of place identity and place dependence dimensions regarding their associations with past experience and familiarity. The results of generalizability test revealed that place attachment measurement does not generalize across these two dimensions, indicating that each dimension may represent different form of attachment and may have different origin and meaning. Williams and Vaske thus concluded that these findings further support the notion that place identity and place dependence constitute distinct dimensions of a single general construct of place attachment, and place attachment is a place specific concept, rather than a global indicator referring to all places.

In the context of recreation rail-trails, Moore and Graefe (1994) examined the nature of recreationists' attachments to the setting in relation to activity-related variables and user's

characteristics. Place attachment was measured by 15 items adopted from Williams and Roggenbuck's (1989) study. Through analyzing the data gathered from more than two thousand trail users, they confirmed the existence of the two dimensions of place attachment – a functional place dependence and a more affective place identity. They also found that place identity was associated with dependence on the setting as a place for an activity, which was a function of frequency of use and distance between the site and the user's home. Length of association with the trail also contributed to the formation of place identity but showed no significant relationship with place dependence (Figure 2. 7). They argued that the functional place dependence may develop relatively quickly as long as the setting is convenient and good for a user's chosen activities; whereas the affective place identity could require longer period of time to emerge.

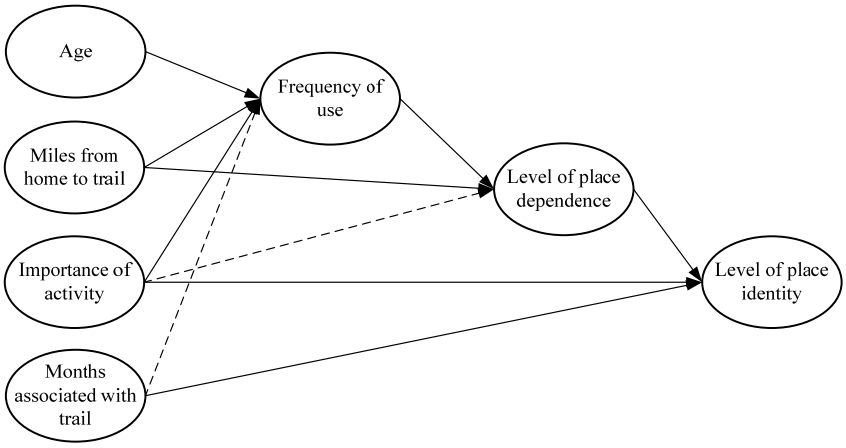


Figure 2. 7 Path analysis model of the development of place attachment
(Source: Moore & Graefe, 1994, p. 30)

The fifteen-item place attachment scale proposed by Williams and Roggenbuck (1989) was also implemented by Bricker and Kerstetter (2000) in their study of level of specialization and place attachment. Other than the widely acknowledged place identity and place dependence dimensions, a third dimension, lifestyle, which represents a deep sense of attachment specific to the place itself and connected to an individual's lifestyle, was identified through principle components analysis, suggesting that more studies are needed to explore the diverse meanings attributed to a place. They also found that low-level specialists rated the place identity dimension as least important, regardless of the specialization dimensions being considered, whereas the relations between specialization dimensions and place dependence were not significant. Their findings emphasize the importance to go beyond the functional appreciation of the setting and explore people's sentimental and emotional bonds with the environment they visit. Their study also demonstrated that place attachment can be a useful tool to reveal recreationists' attitudes toward management alternatives.

Recent work by Brown and Raymond (2007) demonstrated that the 15-item place attachment scale based on past research (Jorgensen & Stedman, 2001; Williams & Vaske, 2003) is a valid and reliable measure. In their study of the relationship between place attachment and landscape values, exploratory factor analysis confirmed the place identity and place dependence dimensions with high internal consistency for both local residents and visitors. Regression

analysis indicated that spiritual, wildeness (naturalness), and aesthetic values were most predictive of these two dimensions of the scale-based place attachment. And wildness and spiritual values were also found be be significant predictor variables of an alternative map-based place attachment index.

Different dimensional solutions were also found in previous research. In response to a lack of suitable operationalization of constructs, Lalli (1992) developed an Urban Identity Scale as measure of urban-related identity. Dimensions proposed for this scale include: Evaluation, or external evaluation, which refers to evaluative comparison regarding the uniqueness of the town relative to other towns; Continuity, or continuity with personal past, which emphasizes the significance of the urban environment for the sense of subjective temporal continuity; Attachment, or general attachment, which refers to a general sense of being at home in the town; Familiarity, or perception of familiarity, which refers to the degree of successful cognitive orientation in the urban environment; and Commitment, which refers to the perceived significance of the town in one's future and was indicated by one's willingness to stay. However, regarding the high inter-scale correlation, especially for the General Attachment dimension, and the high scale reliability, some have suggested that the five dimensions of the Urban-identity Scale are indeed indicative of a more simple factorial structure best represented by Lalli's concept of attachment (Jorgensen & Stedman, 2001, p. 236).

Harris et al. (1996) measured residents' feelings of attachment to apartments with six items related to general attachment, satisfaction with the apartment, and feelings of rootedness, and 17 items related to aspects of aparment life contributed to positive feelings, in an effort to relate place attachment to the ability to regulate privacy. Principle component analysis yielded three factors: a "home experience" factor with items referring to positive feelings and activities; a "rootedness" factor with items referring to potential sorrow feeling when leaving; and a "identity" factor with items referring to identity-manifestation activities. They found that, not only ease of privacy regulation is positively associaed with these three forms of attachment, but also these relationships were mediated by family functioning and sense of control with different level of effects. They believed that these findings support a multifaceted conceptualization of place attachment.

In addition to the place identity and dependence dimensions, Kyle et al. (2004) proposed two new dimensions based on their review of past research on conceptualization of place attachment (Jorgensen & Stedman, 2001; Low & Altman, 1992). The affective attachment dimension intended to emphasiz specifically the emotional component of place attachment, and the social bonding dimension emphasizing the importance of social ties to place. However, no test was carried out to examine the proposed dimensional structure, and no information of inter-dimension relationship was provided. The social bonding dimension was tested, with different sets of measurement items, in another study on the impact of place attachment on recreationists' perceptions of setting density (Kyle, Graefe, Manning, et al., 2004a). However, the low factor loadings ($\lambda<0.4$) of two of the measurement items and the relatively low internal consistency (alpha=0.61) of this scale indicated that the validity and reliability of this social bonding dimension is questionable.

Based on previous research, Hammitt et al. (2006) used the term “place bonding” as an equivalent to place attachment to define the strong emotional tie between developed between people and place in recreation context. In a concern that the wildely acknowledged place identity and dependence dimension may not be able to capture the diverse meaings people ascribed to place, they proposed three additional dimensions as complement: place familiarity, which reflects level of knowledge of a locale; sense of belongingness, which denotes the positive feelings and behaviors to maintain or enhance a locale; and rootedness, which implies the expectation of stability. Structural equation modeling analysis demonstrated that a five-dimension, 24-item place bonding scale achieved proper model fit with reliable factor alpha. Convergent validity and predictive validity analysis provided further supports for the proposed place bonding model.

Generally speaking, there is a lack of rigid validation procedure to examine the dimensionality of place attachment, and this leads to some took the dimensions and operational items suggested by previous research for granted without checking their validity in new context. For example, in Kaltenborn and Bjerke’s (2002) study, the sub-dimensions of place attachment as suggested to be embedded in this concept, such as identity, dependence, satisfaction, and involvement, were arbitrarily gathered by the authors from similar studies, rather than as results of exploratory factor analysis, which have been properly applied in their study to identify landscape categories from respondents’ landscape preference rating scores. Nor was the proposed dimensional structure verified by confirmatory factor analysis. The relationships between these sub-dimensions of place attachment were also left unexplored. Reliance on simple reliability test thus led to a hasty conclusion that place attachment is a uni-dimensional concept.

The following section reviews specifically examples in recent place attachment research that have applied structural equation modeling procedures as a rigorous and illuminative analysis technique to further our understanding of the nature of place attachment and place related concepts and their relationship with other constructs and variables in a systematic and rigorous way.

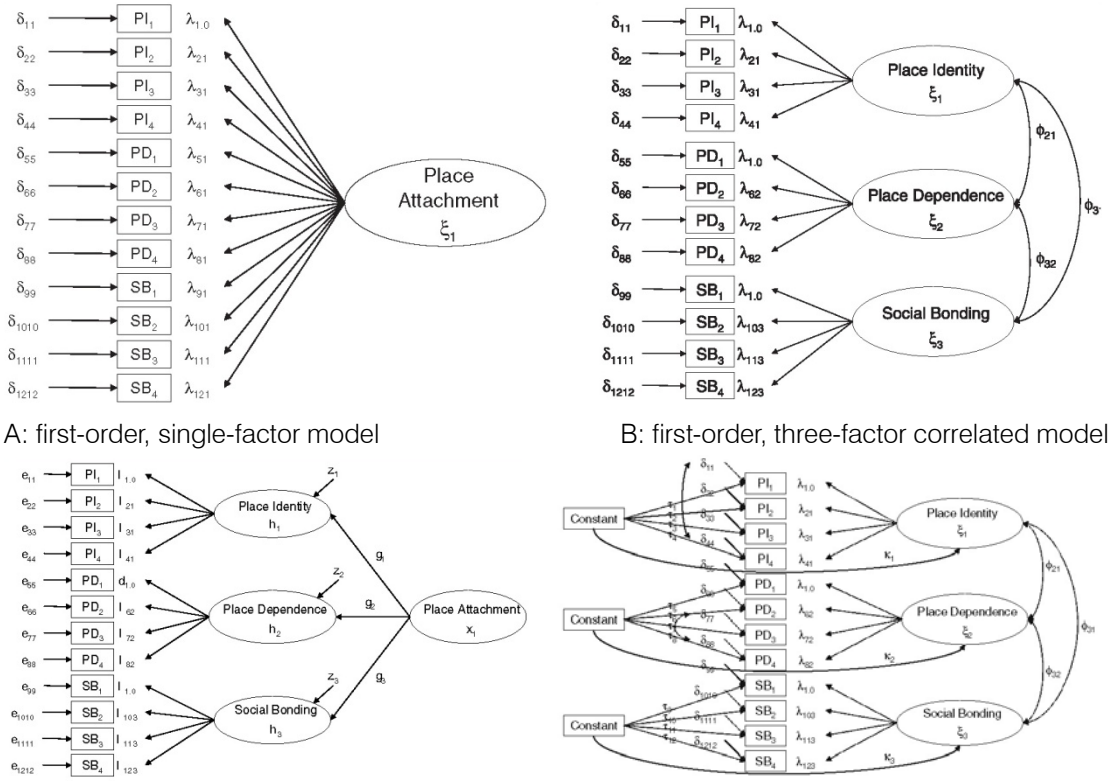
Advanced Quantitative Analysis: Structural Equation Modeling

As a hybrid multivariate analysis technique, structural equation modeling was developed based on and as a more powerful alternative to other basic statistical analysis, including multiple regression, path analysis, and confirmatory factor analysis. Structural equation modeling can be used to provide a quantitative test of a theoretical model hypothesized by a researcher and the relationship between observed variables (or measured, indicator variables) which are used to measure a specific phenomenon or factor, and latent variables (constructs or factors) which are not measured directly but are estimated in the model from measured variables. Schumacker and Lomax (2004, p. 7) pointed out that the advantages of structural equation modeling lie in that, first, structural equation modeling permits complex phenomenon to be statistically modeled and allows direct and indirect effects be examined, thus provides greater insight into the relationship between variables than other basic statistical methods; second, structural equation modeling explicitly take measurement error into account, thus can give greater recognition to the validity

and the reliability of observed scores from measurement instruments; and third, structural equation modeling can be applied in multiple-group and multilevel models, thus provides researchers with greater ability to analyze sophisticated theoretical models of complex phenomenon. Recent applications of structural equation modeling techniques in quantitative place research demonstrate that, not only can various models of the dimensional structure of place attachment concept be tested and compared, but also the relationships between subdimensions of place attachment and other construct can be examined in a comprehensive manner. Thus structural equation modeling serves as a useful tool in facilitating the exploration of the intricate nature of people-place bond phenomenon.

- Examining Dimensionality of Place Attachment

Other than the aforementioned study by Williams and Vaske (2003), there were other studies that utilized structural equation modeling to examine hypothesized dimensional structure of place attachment construct. Kyle, Graefe, and Manning (2005) raised the concern that many of the past studies testing for mean differences between respondent groups regarding their level of place attachment has relied solely on factor scores without prior examination of invariance of the factor structure across groups, especially for the wildly adopted identity-dependence dimensional structure of place attachment proposed and validated by Williams and his colleagues (Williams & Roggenbuck, 1989; Williams & Vaske, 2003). In regard to this, structural equation modeling procedures were used in Kyle, Graefe, and Manning's (2005) study to first, identify the best one out of the four hypothesized measurement model of place attachment, and second, to test the measurement invariance and latent mean structures of the identified place attachment model across two subgroups of a pool of 1,879 recreational trial visitor sample (Figure 2. 8). The results demonstrated that the first-order, three-factor correlated model has relatively better validity and reliability compared with the other models. Confirmatory factor analysis also confirmed the integrity of this factor structure across two subsamples. However, the effectiveness of the social bonding dimension may need further testing to support (refer to previous section).



A: first-order, single-factor model

B: first-order, three-factor correlated model

C: second-order, three-factor model

D: multi-group mean structures model

Figure 2. 8 Place Attachment Models

(Source: Kyle, Graefe & Manning, 2005, p.160-161)

- Examining Predictors of Place Attachment

Kyle, Graefe, Manning, and Bacon (2003) examined specifically the relationship between hikers' attachment to the setting and their activity involvement among four groups of recreationists (Figure 2. 9). Activity involvement was defined as "an unobservable state of motivation, arousal or interest toward a recreational activity or associated product. It is evoked by particular stimulus or situation and has drive properties" (p. 252) and was suggested to have three dimensions: attraction which is a combination of importance and pleasure; self-expression which refers to the impression of oneself that individuals wish to convey to others through their leisure participation; and the centrality of a particular leisure activity in terms of an individual's overall lifestyle (pp. 252-253). Through structural equation modeling, they found that, across the four groups of hikers, the self expression and attraction dimensions of activity involvement were significant predictors of place identity dimension of place attachment, whereas place dependent dimension was only associated with self expression, thus the results provided only partial support for their hypothesized model.

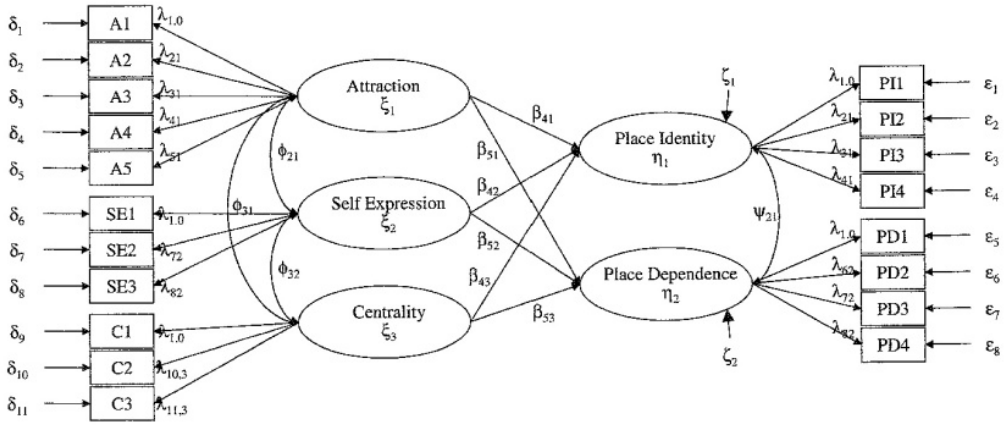


Figure 2. 9 Activity involvement predicts place attachment

(Source: Kyle, Graefe, Manning & Bacon, 2003, p.256)

The validity of the above model proposed by Kyle et al. (2003) was further tested by Kyle et al. (2004) among three different types of recreationists via structural equation modeling (Figure 2. 10). They found that only centrality, which was measured by items referring to friends or others and social interactions centered on the activity and one item attesting to the central role of the activity in the individual's life, had significant and consistent influence on place identity across the three groups, indicating that emotional ties to recreation setting and social ties to the recreation activity are closely related.

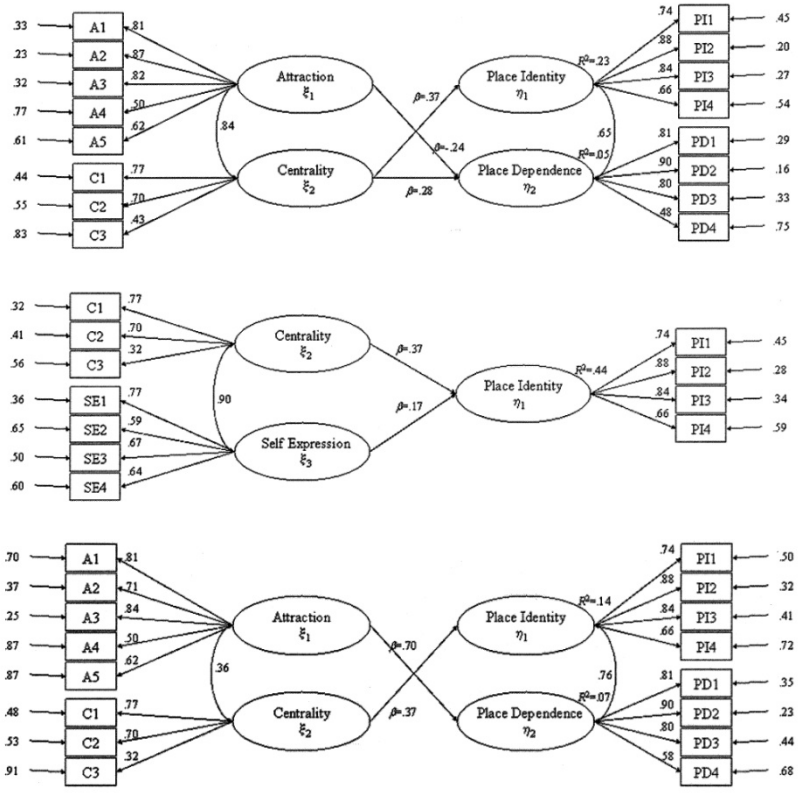


Figure 2. 10 Involvement-Place Attachment Relation for Hikers, Boaters, and Anglers

(Source: Kyle et al., 2004, p.134-135)

In another study, Kyle, Mowen, and Tarrant (2004) utilized structural equation modeling to test the consistency of the structure of their hypothesized model across different groups of respondents regarding the relationship between place motivations and place attachment dimensions (Figure 2. 11). The results offered only partial support for their hypothesized relationships. They found that place dependence was positively associated with the perceived uniqueness of the setting for its ability to improve health. Affective attachment was influenced by autonomy, nature, and health. Place identity was predicted by learn and autonomy. Social bonding was predicted by activity, social, and nature dimensions of place motivations.

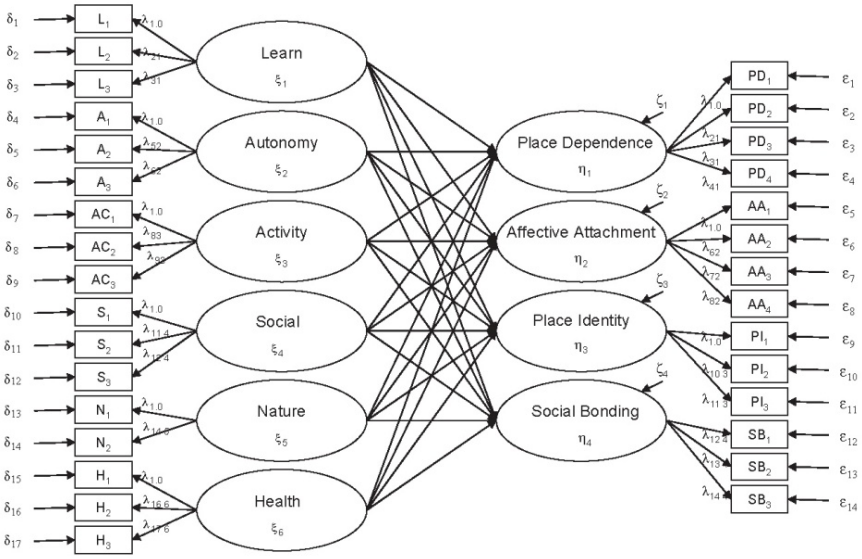


Figure 2. 11 The impacts of place motivations on place attachment

(Source: Kyle, Mowen & Tarrant, 2004, p. 447)

- Examining Impacts of Place Attachment

The aforementioned survey data gathered in the study of Appalachian Trail hikers was further analyzed by Kyle et al. (2004a) in a later study that examined the effect of recreationists' activity involvement and place attachment on their perceptions of setting density. The results of structural equation modeling indicated that only place identity and place dependence were significantly associated with respondents' perceived setting density, and the effect of attraction and self expression on perceptions of setting density were mediated through place identity and place dependence respectively. Although the hypothesized social bonding dimension of place attachment was found strongly associated with attraction and self expression, it had no effect on users' perceptions of setting density (Figure 2. 12).

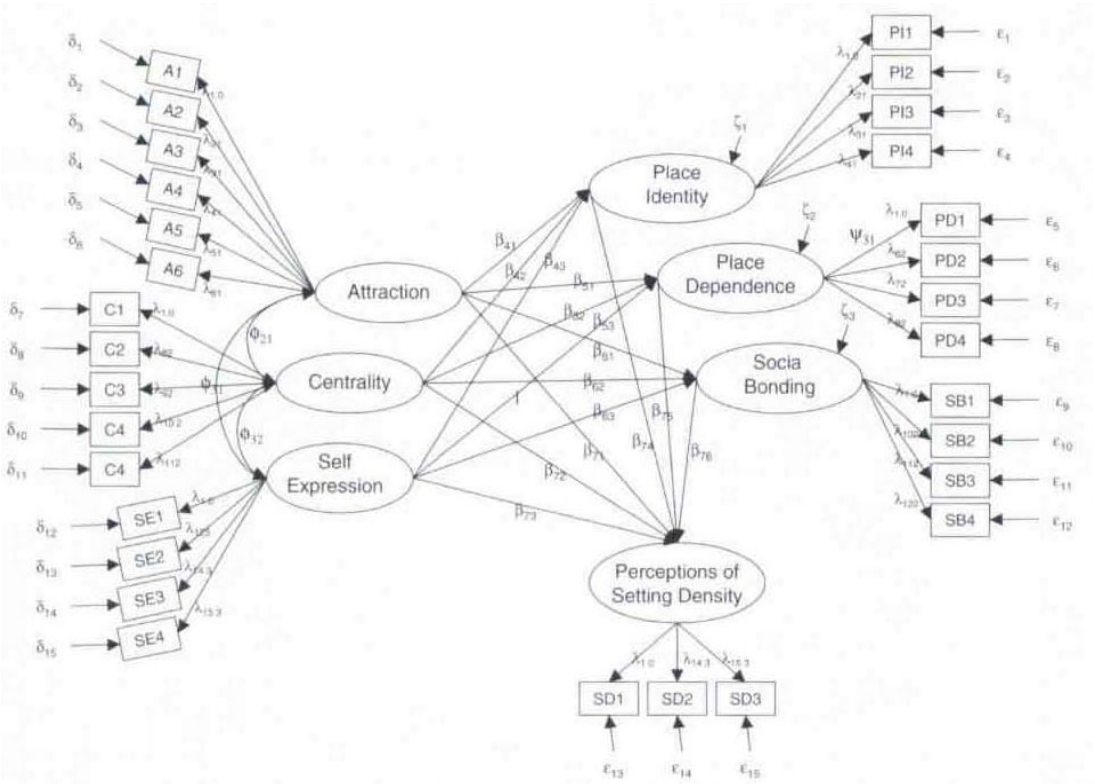


Figure 2. 12 Effect of activity involvement and place attachment on recreationists' perceptions of setting density

(Source: Kyle et al., 2004a, p. 217)

Through structural equation modeling, Kyle et al. (2004b) examined effects of place attachment's dimensions on hikers' perceptions of social and environmental conditions in a recreation trail setting (Figure 2. 13). The results indicated that the model fit the data well, thus providing substantial support for the hypothesized relationships. Specifically, place identity had positive impacts on perceived importance of six social and environmental conditions, indicating that as users' place identity increased, they would be more likely to concern the social and environmental conditions of the setting. However, opposite pattern of relations was found between place dependence and the social and environmental conditions that as users' place dependence increased, they became less likely to perceive the social and environmental conditions that support their experiential goals as important.

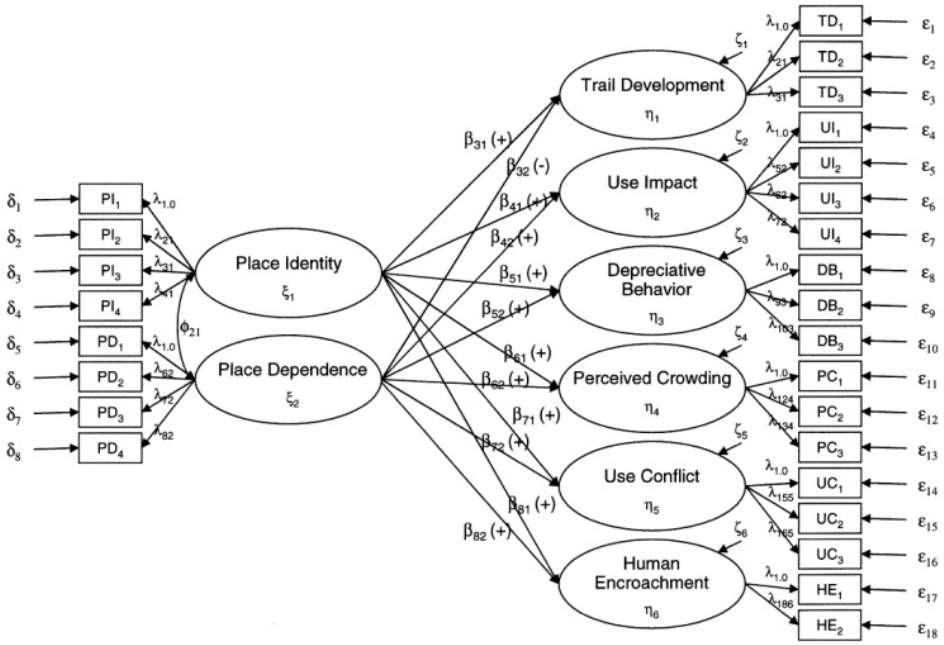


Figure 2. 13 Place attachment dimensions' impacts on perceived social and environmental conditions

(Source: Kyle et al., 2004b, p. 220)

2.3 Research Needs

2.3.1 Dimensionality of Place Attachment

Literature review has demonstrated that place identity and dependence are the most widely acknowledged and scrutinized dimensions of place attachment. Scholars generally agree that both place dependence and place identity imply that place attachment is derived from an "appraisal of the congruence between physical and psychological needs and characteristics of the environment" (Giuliani, 2003, p. 153). However, some may ask "Are they the only salient and meaningful dimensions?" Concern has already be raised regarding the lack of theoretical discussions and empirical research to explore other potential dimensions of attachment and the need to examine hypothesized dimensional structure of place attachment across a wider range of places and context in a rigorous way (Williams & Vaske, 2003, p. 839).

There were attempts to propose new dimensions and to construct new models of place attachment. For example, some argued that place provides the context for meaningful social relationships, thus socially derived attachment should be incorporated into attachment measure. Accordingly, a social bonding dimension was suggested in some studies (Kyle, et al., 2005; Kyle, Mowen, et al., 2004) to emphasize the social aspect of place attachment. However, this dimension did not show good reliability in previous studies[6] and more empirical evidences are needed to support its validity. What is more worrying is its questionable theoretical basis. In line

[6] In Kyle et al.'s (2004) study, the alpha value of the social bonding factor was 0.63, with factor loadings of its component items ranging from 0.56 to 0.59, and in Kyle et al.'s (2005) study, the alpha value was 0.62, factor loadings ranging from 0.31 to 0.79. According to Nunnally's (1978) 0.7 threshold value for Cronbach's alpha, the reliability of the social bonding factor in these two studies can barely be regarded as satisfying.

with previous research (Hidalgo & Hernandez, 2001; Low & Altman, 1992; Mesch & Manor, 1998), which has pointed out that active local social involvement may promote feelings of attachment, it is argued in current study that social bonding is more likely to be one of the sources of place attachment than a subdimension of it. In other words, social bonding or social tie is better understood as one of the predictors of attachment, rather than a constitutional component of attachment.

Past research suggests that people who do feel deeply attached to a place may show great care and concern about the place, and these feelings are rooted in and go beyond the functional and symbolic meaning of place to people as implied in place dependence and place identity dimensions. For instance, Relph (1976) noted that it is attachment that constitutes our roots in places, and "the familiarity that this involves is not just a detailed knowledge, but a sense of deep care and concern for that place" (p. 37). In other words, attachment to a place may imply consciously paying attention to that place. Relph believed that the places to which we are most attached are "fields of care". To him, caring for a place not only involves past-experience-based and future-expectation-oriented concerns for a place, but also reflects "a real responsibility and respect for that place both for itself and for what is to yourself and to others" (p. 38). Carr et al. (1992) also agreed that meaningful places are ones that "resonate with people's lives and evoke patterns of use that create bonds with the space" (p. 188) and ones that "evoke strong feelings of concern, affiliation, and caring" (p. 189). Empirically, a "care and concern" dimension, operationalized as "a sense of responsibility and commitment to continue to attend to and tend for a home place", has been included as one of the indicators of psychological attachment to types of settlements in Feldman's (1996) study.

Moreover, according to Kyle et al. (2004), "identifying with a setting may further inspire curiosity about its prior history" (p. 451). Thus people who feel emotionally connected to a place may be very eager to learn about all that is related to the place. Furthermore, according to Shamai (1991), identifying with a place means that "there is a devotion, allegiance, and loyalty to a place" (p. 350) among the people who are in conformity with the goal of the place. A higher level of sense of place that follows identification with a place is characterized by active involvement in the community of a place due to a commitment to the place. It is reflected by people's willingness to invest their talent, time, or money, in place-oriented activities or organizations. As Relph (1976) noted, what attachment to a place implies is "a complete commitment to that place, a commitment that is as profound as any that a person can make, for caretaking is indeed 'the basis of man's relation to the world'." (p. 38)

Thus, it is argued that place attachment may imply a deep concern about and caring for the condition of place, a strong wish to know about the past, the status quo, and the future of place, a strong sense of responsibility to place, and a strong willingness to devote and commit oneself to place. Not only is this "place caring" dimension of attachment a reflection of the deep connection between an individual and a place to which he or she develops a emotional bond, but also it is an indicator of the behavioral intentions related to place that are consciously held by individuals. There is the need to test the validity and reliability of the "place caring" dimension of place attachment and examine its relationship with other attachment dimensions and other

predictive variables as well as its behavioral implications.

2.3.2 Place Characteristics, Place Perception, and Place Attachment

As elaborated in literature review, physical environment is an integral part of the place concept. However, some have raised the concern that current people-place studies tend to treat place attachment as product of shared behaviors and cultural processes only, while neglecting the role of the physical environment (Hidalgo & Hernandez, 2001; Stedman, 2003).

Stedman (2003) has explore the impacts of characteristics of physical environment on development of place attachment and other place related constructs. However, only objectively measured characteristics[7] of the physical environment of the research setting were involved in Stedman's study. Previous research has shown that there is an imperfect match between objective characteristics of neighborhoods and residents' perceptions of neighborhood quality of life (Mesch & Manor, 1998, p. 509). Therefore, people's cognitions toward the same place may vary a lot. In the case of Stedman, it is very likely that a person who lives in one section of the shoreline area with relatively high level of development still regards the lake area as symbolizing an opportunity to escape the chaotic urban life, if he or she do not regard the development level around residence as disturbing referring to his or her own expectations or criteria. Thus, what was missing in Stedman's (2003) study is the exploration of individuals' own perceptions of the setting conditions, which might be represented, for example, by the statement "In my opinion, the shoreline area of the lake is not overdeveloped", because personal perception toward environment serve as the foundation upon which symbolic meanings are created. It is argued that, as illustrated by the following diagram (Figure 2. 14), only when individuals' subjective perceptions toward or evaluations of the setting conditions are consistent with the actual setting conditions, can the causal link between objectively measured characteristics of the environment, the meanings the physical environment hold that are agreed upon by individuals, and individuals' attachment to the place be formulated. Therefore, in Stedman's case, if positive correlation between lake characteristics and respondents' subjective evaluations regarding each characteristic could be found, his argument that symbolic meanings are mediating the relationships between physical landscape and sense of place would be much more persuasive.

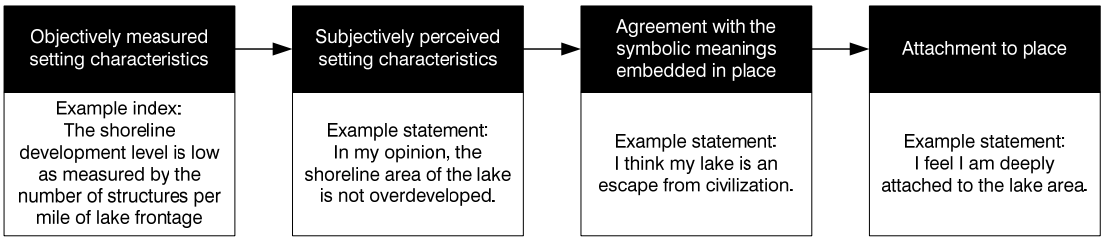


Figure 2. 14 Relationships between objectively measured setting characteristics, subjectively perceived setting characteristics, symbolic meanings, and place attachment (drawn by the author)

Marans and Rodgers (1975) noted that perception of the attributes of neighborhood

[7] The objective characteristics of the lake area include: lake size, average depth, shoreline development density, water clarity, algal biomass, chlorophyll, color, alkalinity, and conductivity.

environment are dependent on, but distinct from, the objective environment. Thus, objective measures of environmental attributes may not be adequate indicators of the quality of the environment, and only through understanding their relationships to subjective indicators can objective measures begin to take on human meaning and provide reliable guidance for public policy (Ladewig & McCann, 1980, p. 112). Similarly, Guest and Lee (1983) argued that individuals' subjective evaluations of the environment are filtered through both the objective conditions and the expectations about what the environment should be, thus "the objective conditions will take on a variety of meanings to individuals depending on what types of expectations they hold" (p. 172). They noted that previous studies on neighborhood evaluation tended to mix variables related to subjective assessment of specific neighborhood conditions with that related to objective discription of the conditions, ignoring the fact that the relationship between them may not always be close (p. 161). Accordingly, Guest and Lee distinguished clearly between people's subjective perceptions and the actual objective conditions of the environment in analyzing their respective impacts on place-related evaluation and place-related sentiment, and the results (refer to next section) supported their hypothesis that subjective predictors and objective characteristics have different relationships with evaluation and sentiments.

Some have suggested introducing observer-based evaluation technique as a way to unfold the typology of people's perceptions toward the everyday physical environment (Craik & Zube, 1976). For example, substantial empirical evidence emerged from landscape perception studies in past four decades have demonstrated that various types of landscapes do elicit diverse responses across different groups of people, and survey and quantitative analyses can help to shed light on the patterns of people's perceptions toward different types of landscapes and landscape attributes (Kaplan & Kaplan, 1989; Zube, Sell, & Taylor, 1982). Therefore, landscape preference research may offer an opportunity to explore how people's cognitive perception toward the physical setting of a place may affect their affective responses to that place and further their attitudes toward how place and landscapes should be planned, designed, and managed.

Kaltenborn and Bjerke (2002) have examined the association between people's preferences for the landscapes of a place and their attachment to that place. They found that for majority of the individual landscapes presented in black-and-white photo format, people's preferential ratings differed significantly across the three groups of varying degree of place attachment. Multiple regression analysis also revealed that place attachment contributes significantly to the attractiveness of majority of the landscape photos and two of the landscape categories. The authors' assumption was that place attachment is one of the antecedents of landscape preference. However, theorization on this causal relationship between landscape preference and place attachment was missing in their study. Actually, the literature reviewed by them only suggests the opposite that landscape is among the factors that may contribute to the development of place attachment. The research question they raised can only be thought as one that concerns possible association between landscape preferences and place attachment rather than one that tries to test a specific causal relationship between them. This contradiction was even more obvious when they commented in discussion section that it is the least attractive landscapes that "elicit" less variation in responses relative to effect of place attachment, a

comment that actually implies that differences in place attachment are results of differences in landscape preferences.

It is argued in current study that place attachment is a psychological consequence which derives from people's knowledge about place, their cognition of place, their experiences with place, and their belief about place. Therefore, it is assumed that preference for a specific type of landscape of a place may imply a tendency to favor previous or imagined experiences associated with this type of landscape and a tendency to agree with what this kind of landscape represents or means to individual or community. Consequently, landscape preference may contribute to the development of place attachment, rather than the other way around. In other words, perceived attractiveness of specific types of local landscapes may influence the development of place attachment in that it may affect the general meaning attributed to the landscape. Thus, landscape preferences should be explored as potential antecedents of place attachment, rather than results of people-place bonds.

To summarize, there is the need to explore the relationship between place attachment and one of its important sources: characteristics of the physical environment as subjectively perceived by people. It is argued that, rather than the "objective" characteristics of physical environment as adopted in some of the previous studies, the "perceived" characteristics of physical environment should be adopted to examine the potential connections between perception toward environmental features, place experiences, and place-related subjective evaluation and affection such as place satisfaction and place attachment, as well as the impacts of environmental perceptions on attitudes and behaviors related to place.

2.3.3 Place Satisfaction and Place Attachment

Past research has differentiated the concept of place satisfaction and place attachment in general terms. For example, Fried (1982) found that local social interactions contributed relatively less to residential attachment, whereas people's residential and community satisfaction were influenced substantially by objective features of the residential environment, among which the physical attributes of the local environment were of major importance[8]. In Giuliani's (2003) opinion, attachment distinguishes itself from satisfaction by its irreplaceable nature. As he noted, "what qualifies attachment is not the positive valence of affects, but that it is perceived as a bond, with an enduring quality, directed toward a specific target, not interchangeable with another with the same functional quality." (p. 148)

Guest and Lee (1983) have differentiated place-based evaluation and place-based sentiments according to their understanding that evaluation or satisfaction with community may result from the congruence between needs and provisions, whereas sentiment is less a result of rational assessment than a result of emotional investment of social nature. They found that, although residents' evaluative feeling, as measured by their satisfaction with the residential environment, was positively correlated with their sentimental feeling, as indicated by the degree to which they would miss an area after moving away from it, these two types of feeling may have different

[8] However, Giuliani (2003) has commented that Fried didn't make clear differentiation between satisfaction and attachment, and most of his discussion actually focused more on satisfaction than on attachment.

conceptual bases regarding their relationships with the other neighborhood attributes. For example, they found that human interaction or facilities centering on human interaction were the main contributors of sentiment, whereas factors such as safety and schooling referring more to basic needs of a population were better predictors of evaluation. Moreover, sentiment was also found to be strongly related to use of local areas or residential location that stimulates interaction, while satisfaction was only related to individual variables indicating the overall niceness of the environment. Furthermore, sentiment seemed to have stronger influence than evaluation on people's behavioral intentions. These results indicated that sentiment is not as universally prevalent as satisfaction. Guest and Lee thus argued that sentimental feelings toward urban neighborhood may be independent of evaluation, as they have different relationships with other neighborhood attributes as well as attitudes and behaviors related to the neighborhood.

Ringel and Finkelstein (1991) examined specifically the distinctiveness of satisfaction with neighborhood and attachment to it. In their study, satisfaction was directly measured via responses to three questions related to general evaluation of the neighborhood, and attachment was measured via a single question "How attached do you feel to your neighborhood?" Their findings suggest that satisfaction is distinguishable from attachment to neighborhood, in that satisfaction is best conceived as an attitude with affective-cognitive and behavioral components, whereas attachment is a bi-dimensional concept composed of physical and social integration.

Regarding the relationship between place satisfaction and place attachment, some suggested that place satisfaction may affect place attachment. For example, Mesch and Manor (1998) found in their study of the determinants of place attachment that both locally based social relationships and satisfaction with the environment were related to the development of place attachment. Individuals' levels of satisfaction with the neighborhood physical and social characteristics were positively associated with their level of attachment to place (p. 514).

Bonaiuto et al. (1999) used path analysis to examine the predictive power of residential satisfaction on neighborhood attachment, the former being measured by perceived residential environmental quality (PREQ) indexes which include items related to a variety of neighborhood features, and the later being represented by a single cumulative variable as result of factor analysis. They found that not only many items within the four main aspects of PREQ indexes, namely architectural and town planning features area, social relations feature area, punctual and non-punctual services area, and context features area, showed significant direct effects on neighborhood attachment, but also the PREQ indexes mediated quite a lot demographic variables' influences on neighborhood attachment. They believed that the results confirmed the assumption that positive evaluation of various aspects of the residential environment underlies feelings of neighborhood attachment, thus empirically connect residential satisfaction study and place attachment study.

Different opinions regarding the relationship between place satisfaction and place attachment are also presented in previous research. Stedman (2003) noted that one may be satisfied with the quality of a place but remain unattached to the place. As well, one could be very dissatisfied with a place yet remain a strong attachment to the place. Kaltenborn (1998) found in his study

that sense of place[9] seems to be more effective in predicting reactions to impacts, and less so in predicting perceptions of environmental conditions, as measured by respondents' expressed level of agreement with statements about the condition of the natural environment. However, this finding may be an artifact of the causal relationship between sense of place and environmental quality evaluation as assumed in Kaltenborn's (1998) study, since it is argued in current study that people's evaluations of the environmental qualities of a place are better understood as potential contributing factors to development of sense of place, rather than as results of sense of place.

To sum up, there is the need to differentiate place satisfaction and place attachment conceptually and operationalize their measurement differently. The relationship between place satisfaction and place attachment as well as their different impacts on attitudes and behaviors also need to be further explored.

2.3.4 Place Meaning and Place Attachment

Previous research has demonstrated that firstly, meaning is the core component of the concept of place (Relph, 1976; Tuan, 1977). It is the meanings as ascribed to place by people that differentiate place from abstract space. Secondly, experience with place is one of the key sources from which place meanings are created, condensed, and maintained. Physical space becomes place when meanings are attached to it during the course of people-place interactions. ''In essence, people confer meaning on the environment in ways that reflect their social and cultural experiences'' (Eisenhauer, et al., 2000, p. 422). It is through experience that what a place means to individual is apprehended, and identification with these meanings has substantial impacts on individual's emotions, attitudes, and behaviors. Thirdly, place meanings are results of human interpretations, which may vary depending on individuals' experiences in place, their background, and the socio-cultural context. Thus meanings of the environment are not given, but are socially constructed. "Any physical place has the potential to embody multiple landscapes, each of which is grounded in the cultural definitions of those who encounter that place." (Greider & Garkovich, 1994, p. 2) Therefore, a place may represent multiple symbolic meanings both within and across individuals.

However, some believe that individual interpretation of place meaning does not deny its generalizability because it implies certain degree of commonality among people interacting with the place (Stedman, 2000). As Relph (1996) argued, "place experiences and meanings are not locked up in the minds of individuals, rather they must be considered to be intersubjective, in other words, shared, because they can be communicated and make clear sense of others." (p. 908) To some, the "social imageability" of physical milieu, the capacity to evoke vivid and widely held social meanings among their occupants, guarantees the feasibility to explore dominant meanings of place across individuals and groups (Lynch, 1960; Stokols & Shumaker, 1981).

Considering that meaning is the essence of place concept, identification with the diverse symbolic meanings held by a place, or what a place essentially signifies or stands for as agreed

[9] The items used in the sense of place scale, developed based on Shamai's (1991) instrument, resemble those used in other attachment research, thus Kaltenborn's (1998) study is still considered as one related to place attachment.

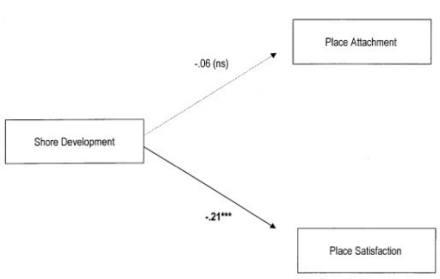
upon by individuals or some social groups, certainly will play a crucial role in the development of people's emotional bonds with that place. In Stokols' (1981, p. 396) words, the sociocultural meanings associated with a setting can be viewed as the "glue" that binds groups to particular places.

All that being said, there is a lack of research that simultaneously addresses the full range of meanings that local communities can bear (Hummon, 1992). Although some noticed that the natural resources management has shifted from focusing exclusively on tangible or objective properties of the environment to the understanding of the subjective, emotional, and symbolic meanings associated with natural places and the personal bonds or attachment people form with specific places or landscapes (Williams, et al., 1992; Williams & Stewart, 1998), such research that attempts to explore the connections between diverse place meanings and place attachment is scant in urban open space context. On the other hand, those studies that examine the effects of characteristics of both people and place and patterns of people-place interactions in predicting place attachment tend to associate these predictor variables with attachment directly, leaving the mechanism and processes behind these relationships unexplored, and thus risk drawing quick conclusions typical of environmental determinism.

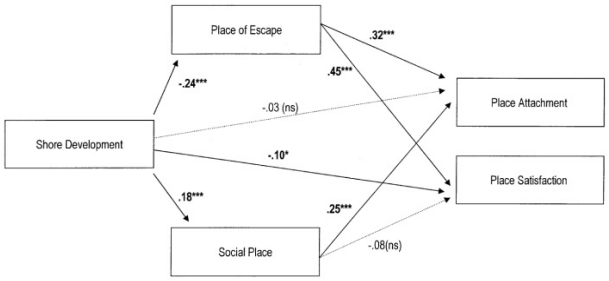
How place meaning may mediate the relationships between the physical characteristics of a place, subjective perceptions toward place characteristics, and attachment to that place has been elaborated in previous section. Besides, it is argued that identification with place meanings may also mediate the relationship between place experience and place attachment. People-place interactions may influence the development of people-place bonds only because these diverse interactions contribute to the formation of place meanings, which as theorized above, underpin place attachment. Moreover, the relationship between place satisfaction and place attachment may also be mediated through place meaning, because identification with meanings embedded in a place may be partly based on positive evaluation of the quality of the place. For example, a person who gives high score on the quality of a park regarding its ability to facilitate social interaction may be more likely to agree that the park symbolizes a place of community than those who give low evaluate to the socialization condition of the park. Conversely, individuals who do not think the quantity and quality of the vegetation in a park are satisfying may be less willing to agree that the park is a representation of urban forest than those who do give positive comments to the condition of plants in the park. Thus, place satisfaction may enhance agreement with the symbolic meanings of place, which in turn will contribute to the development of place attachment.

Stedman's (2003) study is among the few research work that has examined the role that place meaning plays in the development of place attachment. Stedman examined three models that were hypothesized to explain the mechanism of the impact of physical environment on place attachment and place satisfaction: 1) the direct effect model suggests that meaning of place is not constructed via experience, but rather is imbued in the setting itself, and assumes a direct relationship between landscape features and sense of place; 2) the meaning-mediated model assumes that physical features will influence the symbolic meanings of the landscape, which may influences people's evaluation and emotional response to the place such as attachment;

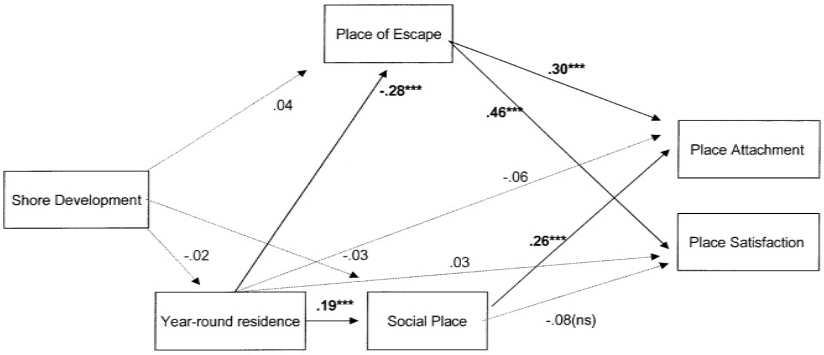
and 3) the experiential model hypothesizes that the physical environment, by virtue of certain characteristics, enable or constrain the place experiences that will shape place meanings, which in turn will affect sense of place. Based on path analysis via structural equation modeling, Stedman found that: 1) in the direct effect model, the degree of shoreline development as an indicator of the physical characteristic of the environment had significantly negative impact on respondents' level of satisfaction but no effect on place attachment, and this model did not fit the data well; 2) the meaning-mediated model showed a good fit to the data. Two opposite indirect effects of shoreline development on place attachment mediated via two different place meanings were identified, one was a negative impact on viewing the lake as "place of escape" and the other was a positive impact on perceiving the lake as "social place". Stedman believed that this explained why environmental characteristic of the lake area was not associated with place attachment in the direct model. In addition, it was found that the impact of shoreline development on place satisfaction was composed of a direct negative effect and an indirect negative effect mediated via agreement with the meaning of lake-shore property as "place of escape"; 3) both the original and the adjusted experiential model exhibited poor fit. Shore development was found having no significant impact on respondents' types of year-round residence, a variable used to measure people's intensity of shore experience (Figure 2. 15).



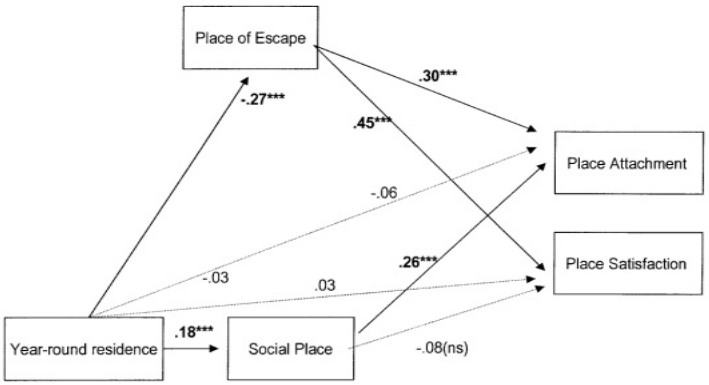
(a) Direct effect mode



(b) Meaning-mediated model



(c) Experiential model



(d) Adjusted experiential model

Figure 2. 15 Models concerning the impact of physical environment on place attachment

(Source: Stedman, 2003, p.679-681)

To sum up, research is needed in the context of urban open spaces to 1) explore the diverse meanings of these spatial settings as identified by people; 2) examine the relationship between place meanings and place attachment, that is how identification on place meanings may affect place attachment; 3) investigate the effects of predictor variables on place attachment that are mediated through their contributions to identification with place meanings.

2.4 Research Framework and Hypotheses

2.4.1 Research Gaps in Place Attachment Studies

Several research gaps in place attachment studies have emerged as discussed in the previous sections (Figure 2.16). Firstly, there is a lack of theoretical discussion on alternative composing dimensions of place attachment other than the widely acknowledged place identity and place dependence dimensions. Place literature suggests that place attachment may imply a deep concern about and care of place and a strong sense of responsibility and commitment to place. Thus, there is the need to test the validity and reliability of the structural model of place attachment that incorporates this ignored “place caring” dimension empirically and examine its relationship with other predictive variables as well as its behavioral implications.

Secondly, past research has suggested various factors that may affect place attachment. More often than not, however, only the direct relationships between these factors and place attachment were analyzed. This kind of direct association is prone to determinism or oversimplification of the complex nature of the phenomenon of place attachment, leaving the mechanism of its formation unexplored. Since place is a meaning-based concept, it is argued that identification with the meanings ascribed to place may play a significant role in the development of place attachment due to its key intermediate position. Thus, there is the need to explore the mediating effect of place meaning in the prediction of place attachment.

Thirdly, there is the need to differentiate those fundamental structural factors, such as socio-economic characteristics of people and physical characteristics of place, from those behavioral and psychological factors, such as place experience, place perception, place satisfaction, and place meanings and theorize the causal relationships between them accordingly.

Finally, there is the need to examine the implications of place attachment for people’s attitudes and behaviors related to place. To sum up, literature review indicates that there is a dire need to frame place attachment research in a more systematic and comprehensive way so that we can obtain a better understanding of what place attachment is in essence, where it is derived from and how it develops, and how it may influence people’s attitudes and behaviors related to place.

Socio-economic characteristics of people:
(Cuba & Hummon, 1993; Goudy, 1990; Hidalgo & Hernandez, 2001; Jorgensen & Stedman, 2006; Keller, 1968; Mazumdar & Mazumdar, 1993, 2004; Rowles, 1983; Sampson, 1988; Taylor & Townsend, 1976)

People-place interactions:
(Eisenhauer, Krannich, & Blahna, 2000; Feldman, 1990; Gerson, Stueve, & Fischer, 1977; Goudy, 1990; Hidalgo & Hernandez, 2001; Kasarda & Janowitz, 1974; Kyle, Bricker, Graefe, & Wickham, 2004; Kyle, Graefe, & Manning, 2004; Kyle, Graefe, Manning, & Bacon, 2003; Mesch & Manor, 1998; Milligan, 1998; Ryan, 1997, 2005; Sampson, 1988; Stedman, 2003; Vorkinn & Rises, 2001; Williams, et al., 1992)

Place characteristics:
(Cuba & Hummon, 1993; Eisenhauer, et al., 2000; Hidalgo & Hernandez, 2001; Kaltenborn, 1997; Ryan, 1997; Stedman, 2003; Williams, et al., 1992)

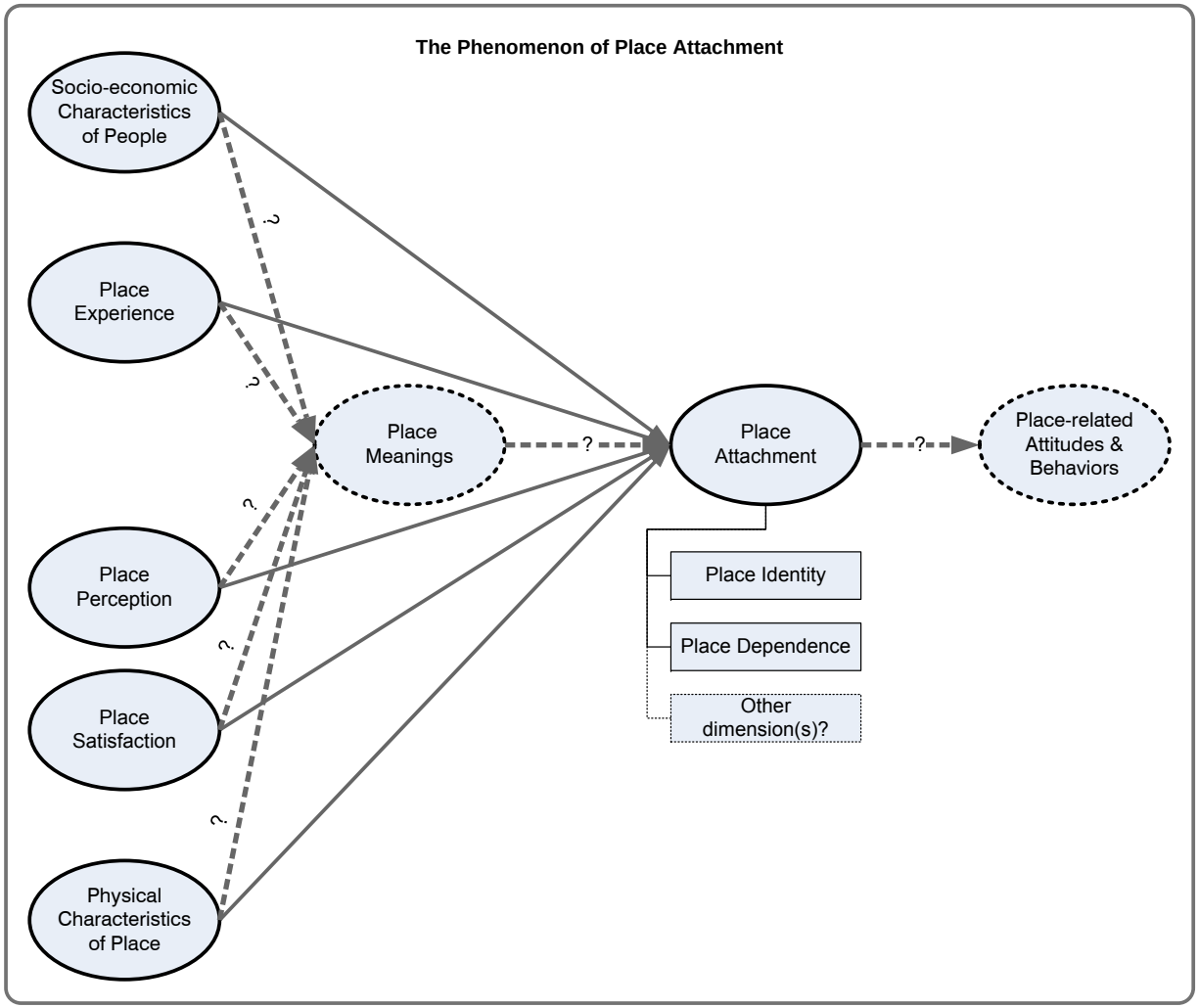


Figure 2.16 Past research and research gaps in place attachment studies

Impacts of place attachment:
(Guest & Lee, 1983; Kaltenborn, 1998; Kyle, Graefe, Manning, & Bacon, 2004a, 2004b; Kyle, Absher, & Graefe, 2003; Ryan, 1997; Vorkinn & Rises, 2001; Williams, Patterson, Roggenbuck, & Watson, 1992)

Dimensionality of place attachment:
(Bricker & Kerstetter, 2000; Brown & Raymond, 2007; Cuba & Hummon, 1993; Hammitt, Backlund, & Bixler, 2006; Harris, Brown, & Werner, 1996; Jorgensen & Stedman, 2001, 2006; Kyle, Bricker, et al., 2004; Kyle, Graefe, & Manning, 2005; Kyle, Graefe, et al., 2003; Kyle, Graefe, Manning, et al., 2004a, 2004b; Kyle, Mowen, & Tarrant, 2004; Lalli, 1992; McAndrew, 1998; Moore & Graefe, 1994; Ryan, 1997; Stedman, 2000, 2002; Taylor, Gottfredson, & Brower, 1985; Williams, Andersen, McDonagh, & Patterson, 1995; Williams, et al., 1992; Williams & Roggenbuck, 1989; Williams & Vaske, 2003)

2.4.2 The Structure of People-Environment Relationship

Previous place research has shed light on how the concept of place and people-environment relationship should be explored. Rapoport (1977, p. 28) noted that any attempt to explore people-environment relationship must include investigations concerning three broad areas of human psychological processes: 1) the cognitive process, which meanings "knowing something" and involves specifically "perceiving, knowing and thinking, the basic processes whereby the individual knows his environment"; 2) the affective process, which means "feeling something about it" and involves specifically "feelings and emotions, about this environment, motivations, desires and values"; and 3) the conative process, which means "doing something about it" and involves specifically "acting, doing, striving and thus having an effect on the environment" in response to the first two processes. Canter (1991) also argued that place represent a confluence of cognitions, emotions and actions organized around human agency. In this respect, Canter updated his early conceptualization of the nature of place as the result of relationships between actions, conceptions and physical attributes (refer to Canter, 1977) by suggesting that greater theoretical conherence can be obtained by taking into consideration the cognitive, affective, and conative processes of people-place interactions.

Referring to the phenomenon of people-place bond specifically, Low and Altman (1992) indicated that, besides affect and emotions, cognition (thought, knowledge, and belief) and practices (action and behavior) are also involved in the development of place attachment. According to Low and Altman, place attachment involves an interplay of knowledge and beliefs, affect and emotions, behaviors and actions in reference to a palce (p. 5). It is obvious that there is a theoretical consistency between the components of place attachment as suggested by Low and Altman (1992) and the structure of human-environment relationship as observed by Rapoport (1977) and Canter (1977, 1991). This common theme is also reflected in other scholars' theorization. For instance, Shumaker and Taylor (1983) considered attachment to place as "a multilevel person-place bond that evolves from specifiable conditions of place and characteristics of people, and that has implications for the attitudes and behaviors of individuals toward their sociophysical environments" (p. 223). Thus, place attachment includes "cognitions of satisfaction and expectations of stability, feelings of positive affect, greater knowledge of the locale, and behaviors that serve to maintain or enhance the location." (p. 237) Brown and Perkins (1992) also argued that place attachment should be conceptualized as positively experienced bonds developed over time as a result of the behavioral, affective, and cognitive ties between individuals and/or groups and their sociophysical environment (p. 284).

Therefore, regarding how the relationship between people and place and, specifically, how the phenomenon of people-place bonding should be comprehended, a common thread emerging from current place literature is a three-fold theoretical perspective that emphasizes the importance of understanding the *cognitive origins*, *affective nature*, and *conative implications* of place-related phenomenon. This line of thought underpins the theoretical framework of place attachment proposed in current study.

It should be noted that the three-fold theoretical perspective of place constructs as suggested in place literature should be treated as a frame of reference that helps to guide the exploration of a

wide range of processes relevant to place attachment rather than a schema to decipher the very structure of place attachment itself. Thus, it is necessary to differentiate inquiries about what kinds of feelings place attachment actually embodies from those concerning where place attachment derived from, how it develops, and what place attachment may influence or what the consequences of place attachment might be.

2.4.3 A Theoretical Framework of Place Attachment

Based on review of place literature and the research needs identified, a tripartite theoretical framework of place attachment (Figure 2.17) is proposed to guide the current study. According to this framework, the phenomenon of place attachment is composed of three closely related, however distinct, components: the *affective* component, the *cognitive* component, and the *conative* component, which correspond with the three-fold structure of human-environment relationship as suggested by place researchers. Specifically, the affective component concerns the dimensional nature of place attachment and is manifested in feelings, affect, and emotions about place; the cognitive component, together with the exogenous structural factors such as socio-economic characteristics of people and the physical characteristics of place, concerns the potential sources of place attachment and is manifested in knowledge, experiences, perceptions, thoughts, and beliefs related to place that are the results of people-place interactions; and the conative component concerns the consequent impacts of place attachment and is manifested in attitudes, behaviors, and actions related to place.

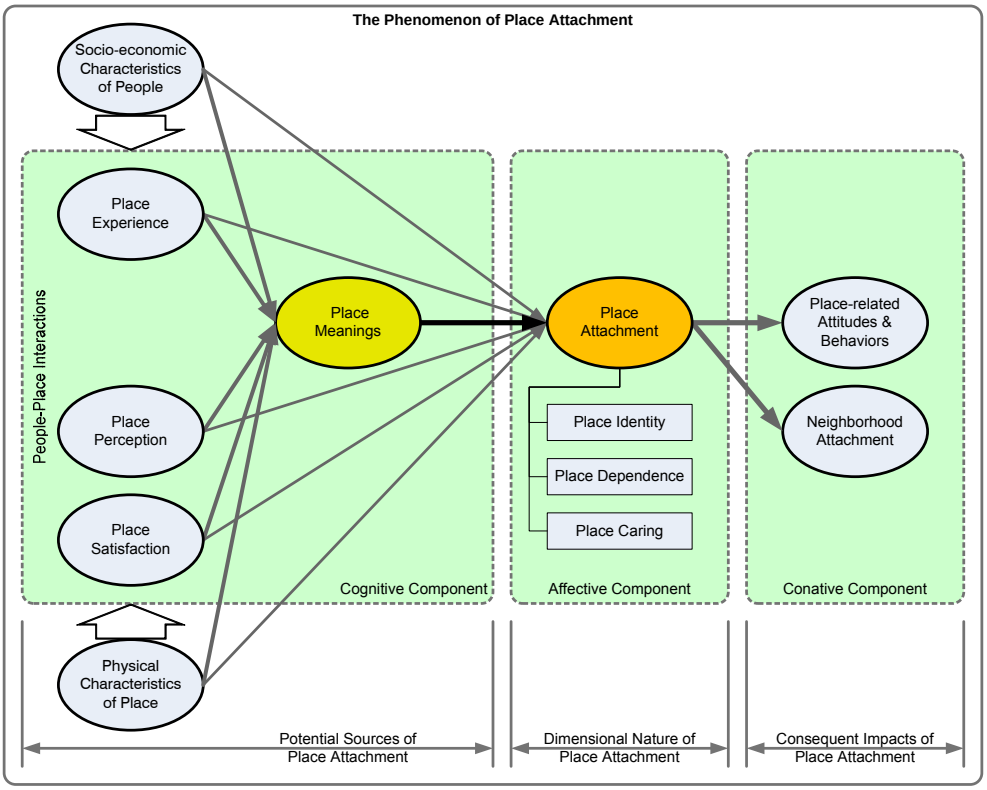


Figure 2.17 A theoretical framework of place attachment

What the framework emphasizes is that a comprehensive understanding of place attachment can be achieved by integrating investigations of its nature, its sources, and its impacts. In other

words, exploration of the phenomenon of people-place bonding should “move beyond quasi-poetic statements” (Stedman, 2000, p. 1) and address systematically its *intrinsic structure*, its *external origins*, and its *subsequent consequences* so that the dimensionality of place attachment, the factors and processes that underlie the mechanism of its development, and its behavioral implications can be examined systematically and its meaning and significance be grasped in a comprehensive way.

In accordance with this theoretical framework, **place attachment** is defined in this study as a positive emotional bond that develops between individual or groups of people and a geographic locale as a result of identification with the meanings ascribed to the physical and socio-cultural environment of that spatial setting that is derived from the perception, experience, and evaluation of the place. Not only is place attachment characterized by a strong self-identity in reference to place (place identity), continuous functional reliance on place (place dependence), and persistent care of and commitment to place (place caring), but also it has substantial implications to place-related attitudes and behaviors. The following are the research hypotheses proposed according to this theoretical framework.

2.4.4 Research Hypotheses

Hypothesis 1: Place attachment is a multidimensional construct. It is best understood as being composed of three distinct but interrelated dimensions: place dependence, place identity, and place caring.

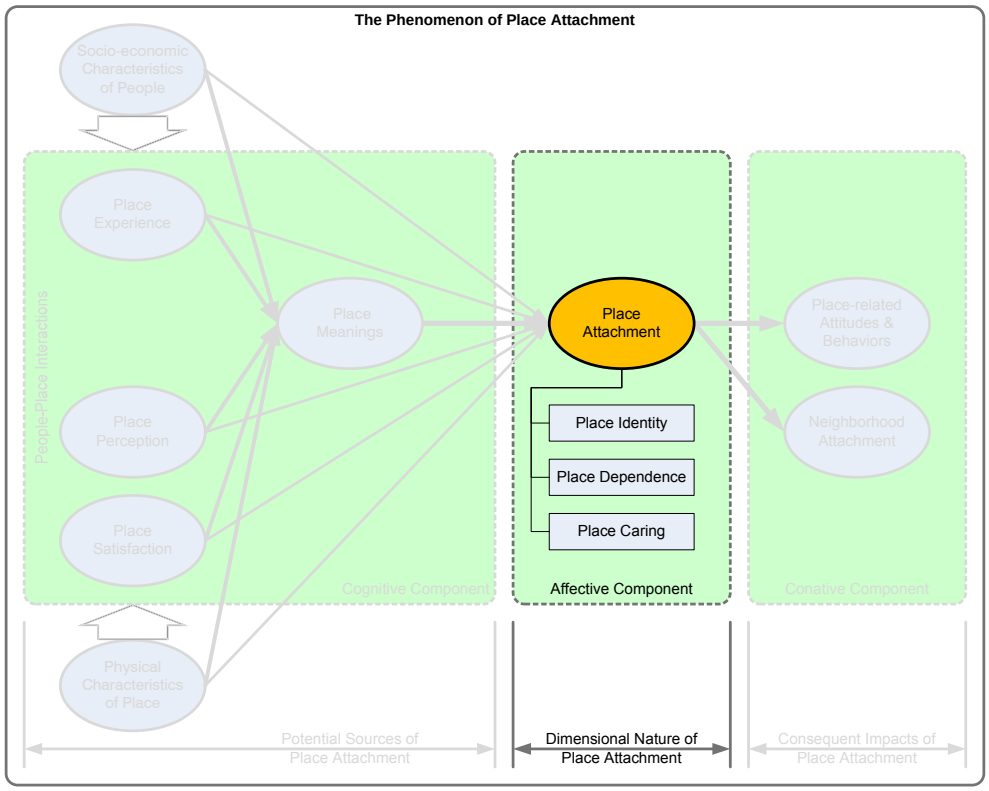


Figure 2.18 Hypothesis 1

The first hypothesis is concerned with the dimensional nature of place attachment (Figure 2.18).

Place literature has demonstrated that in essence the phenomenon of people-place bond reflects an affective relationship between people and landscape that “goes beyond cognition, preference, or judgment” (Riley, 1992, p. 13). As noted by Low and Altman (1992), “one of the hallmarks of place attachment that appears consistently in most analyses is that affect, emotion and feeling are central to the concept.” (p. 4) It is argued that among these emotional responses, the care and concern people have for place, the sense of responsibility to place, and the desire of commitment to place are both crucial and salient. Therefore, the emotional responses inherent in place attachment are characterized not only by a “place-people” relation that indicates the functional and symbolic significances of place to individuals or groups, as represented by the place dependence and place identity dimensions, but also by a “people-place” relation that implies people’s explicitly or implicitly expressed concern about, care of, and commitment to place, as represented by the place caring dimension. Thus, it is believed that the three-dimensional structure that includes both the widely acknowledged and frequently tested place dependence and place identity dimensions and a place caring dimension which is ignored in place literature captures the most essential aspects of the concept of place attachment and needs to be examined empirically.

Hypothesis 2: Place attachment may vary depending on a variety of factors, among which identification with place meanings is the most prominent one because it mediates the relationships between place attachment and its predictors: place attachment is a meaning-based concept.

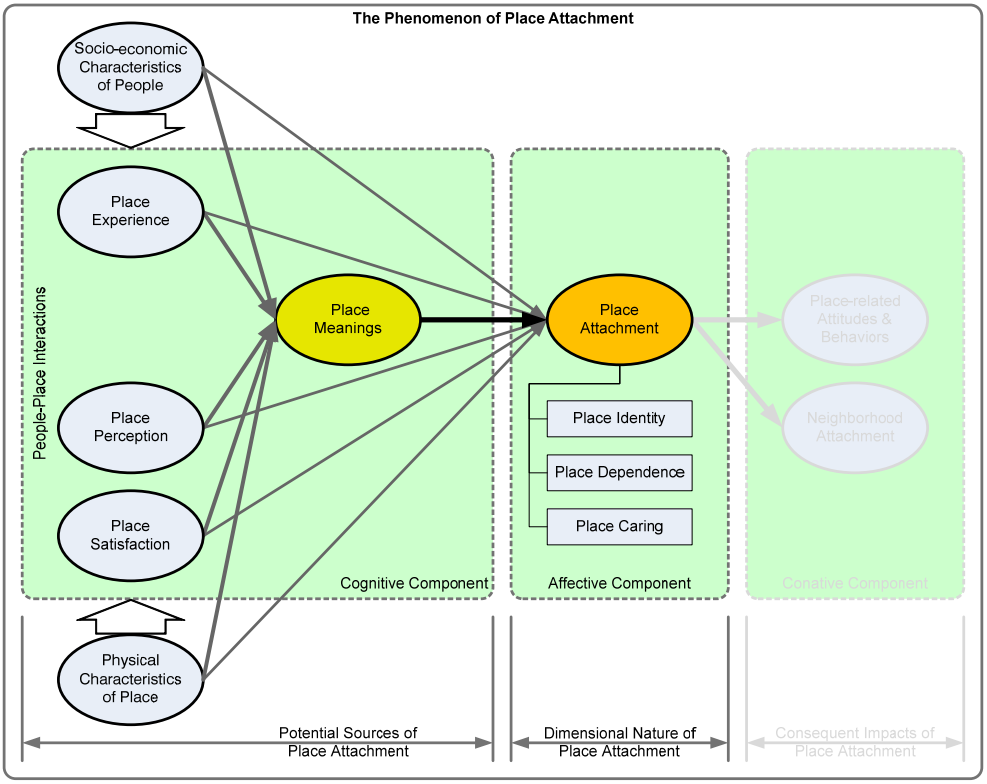


Figure 2. 19 Hypothesis 2

The second hypothesis concerns the sources of place attachment and the significance of place

meaning as underlying the mechanism of place attachment (Figure 2. 19). This hypothesis is composed of three sub-hypotheses. It is believed that the sequential examinations of the three sub-hypotheses is necessary to provide empirical evidences to validate whether place meaning plays a significant role in the formation of place attachment.

Hypothesis 2a: Place attachment may vary depending on a variety of factors, such as the physical characteristics of place, people's socio-demographic characteristics, their experience of place, their perception of the characteristics of the physical environment of place, their evaluation of place, and their level of agreement with the meanings attributed to place.

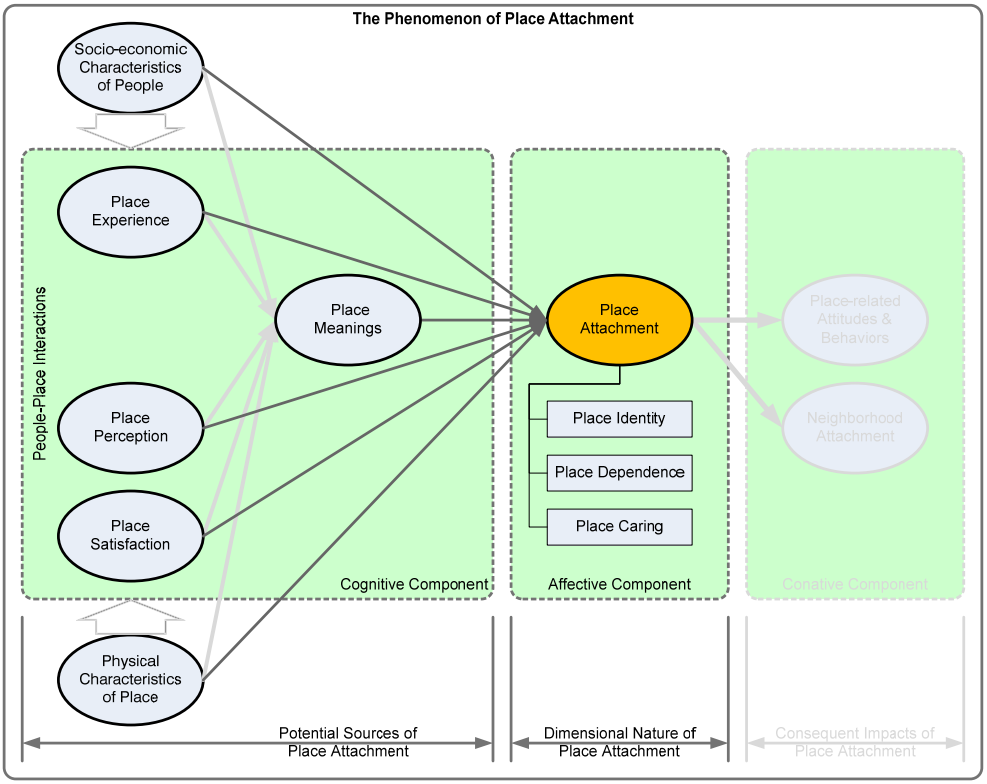


Figure 2. 20 Hypothesis 2a

The first sub-hypothesis concerns the direct effects of the potential factors that may affect place attachment (Figure 2. 20). As suggested in literature, place attachment may vary across groups of different socio-demographic backgrounds and other personal characteristics. This study focuses on examining whether residents' age, length of residence, and their level of environmental knowledge and frequency of environment-related activities may affect their attachment to nearby neighborhood park.

Opinons regarding the role of physical environment varies. For example, Jackson (1994) believes that "a sense of place is something that we ourselves create in the course of time. It is the result of habit or custom." But he also pointed out that to some, "a sense of place comes from our response to features that are already there - either a beautiful natural setting or well-designed architecture. They believe that a sense of place comes from being in an unusual composition of

spaces and forms - natural or man-made." (p. 151) Therefore, there is the need to examine empirically whether place characteristics itself may affect place attachment. Specifically, in the context of current study, it is necessory to find out whether different type of landscape of neighborhood parks may be associated with different levels of attachment to these settings. In other words, it is to be examined that whether simply being living near a park of a specific type of landscape may lead to higher level of park attachment.

Besides the structural factors mentioned above, it is believed that place attachment may develop in the processes of people-place interactions, which include experience, perception, and evaluation of place. Firstly, it is hypothesized that how people experience a place and the intensities of various forms of spatial-setting-based activities may affect their place attachment. As the intensity of place experience increases, it is expected that the strength of place attachment will also increase. Moreover, as a specific type of people-place interaction, place-based social interaction, which is different from other forms of socializations that may not necessarily require the support of physical environment, is also hypothesized to contribute to place attachment since the meanings derived from this type of social interaction are connected directly with the spatial setting of a place. Furthermore, since place attachment is hypothesized to be a multidimensional concept, it is assumed that the relationships between different types of place experiences and the dimensions of place attachment may not be identical.

Secondly, as argued in Research Needs section, what may affect people's recognition of a place are the characteristics of the place as subjectively perceived by them. Therefore, it is hypothesized that how people perceive the physical characteristics of a place may affect their attachment to the place. Specifically, it is hypothesized that the typology of the landscape of neighborhood parks as perceived by residents may be associated with different levels of place attachment due to different meanings attributed to the salient characteristics of each type of landscape. In addition, it is argued that the effects of the characteristics of physical environment on place attachment may depend on their contributions to a special quality or identity that may distinguish one place from the others. Thus, it is hypothesized the extent to which a place is perceived to be distinct or unique from the others may be positively associated with the strength of place attachment.

Thirdly, it has been pointed out that emotional bonding with place and subjective assessments of place are distinct concepts in that they involve different mechanisms of development: place attachment is emotional response in nature, whereas place satisfaction is evaluative belief fundamentally. Although place satisfaction may not necessarily be associated with place attachment, it is hypothesized here that positive evaluation of the quality of a place may indicate that the condition of the place is regarded as agreeable and consistent with expectations, thus reinforcing the meanings held by the place, which consequently, may lead to stronger attachment to that place.

Fourthly, since meaning is the core of place concept, it is hypothesized that identification with the meanings characteristic of a place will have substantial contribution to place attachment. The more one identifies with the shared beliefs about what a place symbolizes or represents basically,

the more likely he or she will develop attachment to the place. Since different meanings might be attributed to the same place, it is assumed that identifications with different dominant meanings of neighborhood parks as shared by residents might be associated with different dimensions of place attachment.

Hypothesis 2b: Among the predictor variables, identification with place meanings is the most prominent one in terms of the contribution to place attachment.

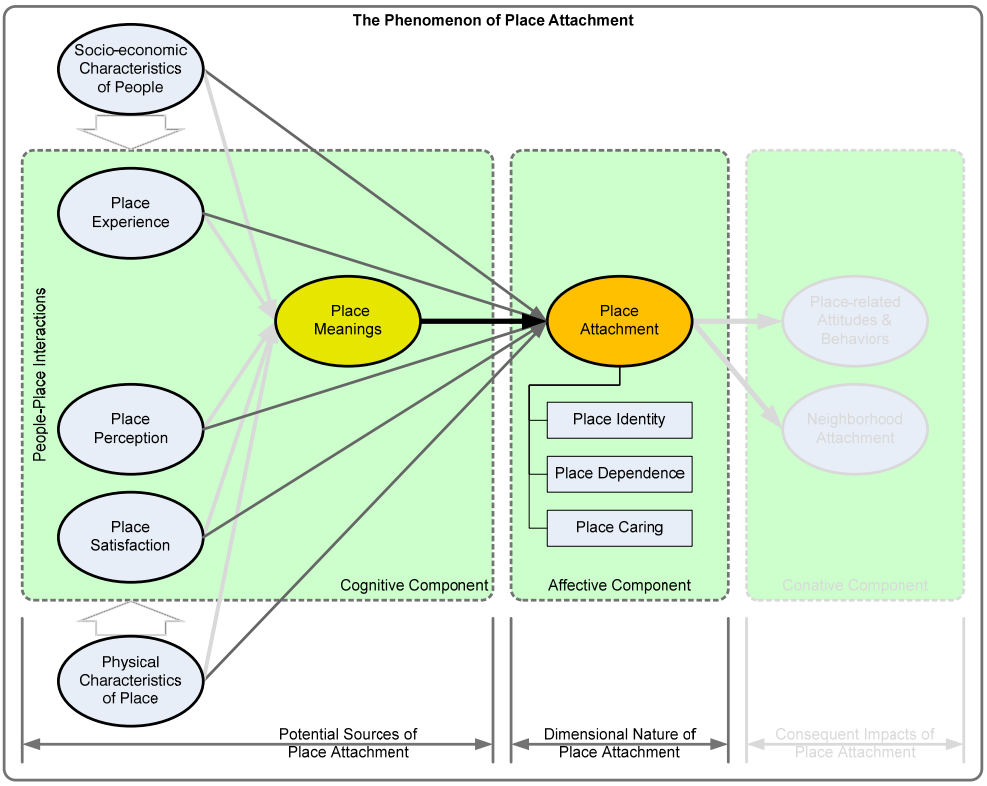


Figure 2. 21 Hypothesis 2b

The second sub-hypothesis concerns the prominence of place meaning in terms of the effect on place attachment as compared with the other predictive factors (Figure 2. 21). The examination of previous sub-hypothesis can only show the individual effects of the hypothesized predictors belonging to different domains on place attachment. Therefore, it is necessary to examine whether place meaning may affect place attachment significantly over and above the effects of the other factors. Positive results of this examination may provide further evidence that identification with place meanings features a prominent factor of place attachment when considered together with the significant factors from the other predictive domains.

Hypothesis 2c: Identification with place meanings plays a crucial role in the development of place attachment in that it mediates the relationships between other predictor variables and place attachment.

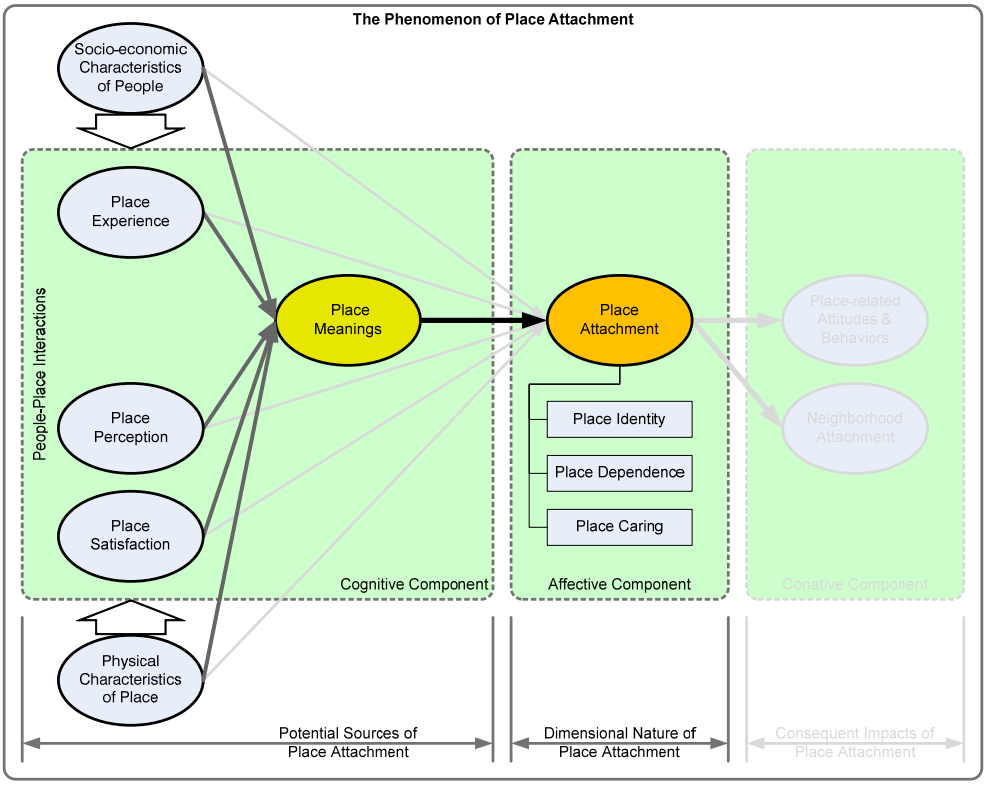


Figure 2. 22 Hypothesis 2c

Based on the results of the previous two sub-hypotheses, the third sub-hypothesis will further examines the significance of place meaning as a key factor that underlies the mechanism of the development of place attachment (Figure 2. 22). As suggested in literature, not only may environmental perception and environmental experience of a place alter the values, beliefs, and wisdoms shared by people (Brandenburg & Carroll, 1995), but also subjective evaluations of environmental qualities may have substantial influences on how the place meanings will be perceived and identified with. In other words, it is very likely that why place experience, perception, satisfaction, and probably the other structural factors may affect place attachment is because that they all contribute in various ways and to varying extent to the identification process with the meanings attributed to place, which in turn, may lead to the formation of emotional bond with place. Therefore, it is hypothesized that place meaning plays a crucial role in the development of place attachment in that identification with place meanings is one of the key preconditions of the formation of people-place bond and it mediates, either completely or partially, the relationships between place attachment and its predictive factors.

Hypothesis 3: Place attachment has substantial implications to place-related attitudes and behaviors.

The emotional bonding between people and place may not be an end in itself. The third hypothesis concerns the impacts of place attachment on place-related attitudes and behaviors (Figure 2. 23).

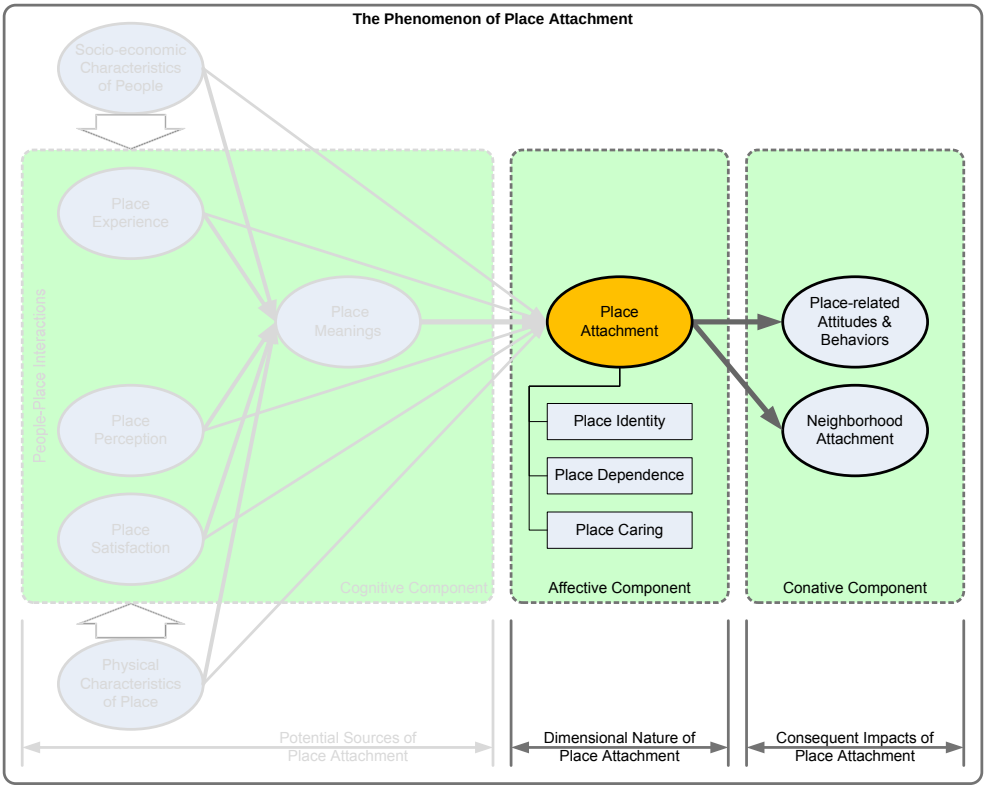


Figure 2. 23 Hypothesis 3

Hypothesis 3a: Place attachment may affect people's attitudes towards environmental design and management, their behavioral intentions when facing negative environmental changes, and their willingness to participate in place-related activities.

The first sub-hypothesis concerns the attitudinal and behavioral implications of place attachment. It is hypothesized that attachment to a place as a psychological consequence of the combined effects of environmental perception, experience, evaluation, and identification with place meanings may have substantial impacts on attitudes and behaviors related to the place. The stronger people's attachment to a place, the more likely they will favor the environmental management strategies that may consolidate the meanings of that place as identified by them and that may maintain and strengthen the emotional bonds with the place, they more likely they may suffer psychologically from environmental changes to the place that are regarded as undesirable, the greater the tendency for them to fight against negative changes that may break their emotional tie with the place, and the greater their willingness to participate in activities that may enhance the quality of that place.

Hypothesis 3b: In the context of public housing, residents' attachment to nearby open space is a significant contributor to their attachment to the neighborhood they live in.

The second sub-hypothesis is proposed in regard to the context of residential environment of public housing. It is hypothesized that residents' attachment to neighborhood parks will contribute significantly to their attachment to their neighborhood in that the emotional tie with these adjacent recreation spaces may enhance residents' identification with the neighborhood they live in as a total living environment that is inseparable and irreplaceable from their life.

2.5 Chapter Summary

Place literature has demonstrated that meaning is the kernel of place, an essential concept in human-environment relationship research. In contrast to the phenomenon of placelessness, a disregard of the essence of place, sense of place indicates an awareness of the spirit and meaning of place that serve as psychological anchor of our everyday life, and it is characterized by a tendency to form deep people-place emotional ties. Although being treated as interchangeable terms by some, sense of place and place attachment are different constructs, in that the former refers to a broader general domain of research that encompasses a wide range of feelings, meanings, values and symbols associated with place, whereas the latter usually refers more narrowly to a specific aspect of the overall relationship with place (Patterson & Williams, 2005, p. 367), that is the positive emotional tie between people and place.

Past research has demonstrated that, as a salient phenomenon in people-place relationships place attachment may vary across individuals or groups of people depending on how they perceive the physical and social environment of place, how they experience and evaluate place, and how they interpret the meanings of place, as well as their own background particulars. The emotional bond between people and place not only plays crucial role in the formation and maintenance of individual and community identity, but also exerts substantial influences on attitudes and behaviors.

However, the multi-disciplinary nature of place attachment research, as reflected in literature, has led to various conceptualizations of the phenomenon of people-place bond across a wide spectrum of philosophical orientations and research paradigms, and few consensuses have been reached regarding the guiding framework of place attachment study in general and the very structure, origins, and consequences of attachment construct in particular. Place attachment is either explored as an umbrella concept encompassing a variety of feelings or beliefs, or subsumed as a sub-component of other construct. Methodological divarications and overlapping of operational measures with other constructs make comparison of results of place attachment studies even harder.

The proposed tripartite theoretical framework attempts to delineate the nature, sources, and impacts of place attachment in a systematic and comprehensive way. The framework not only brings out the need to incorporate place caring as an additional dimension into the multifaceted structure of place attachment and examine the effects of environmental perception, experience and evaluation on attachment, but also, and most importantly, emphasizes the key mediating role that identification with place meanings plays in the formation of place attachment. Subsequent attitudes and behaviors as results of identification with place meanings and place attachment are also suggested to be of crucial significances to environmental design and management.

CHAPTER 3. METHODOLOGY

This chapter describes the research methodology implemented in this study. The first section introduces the research design which is concerned with the research approaches adopted, the choosing of research settings on which the study was situated, and the process of sampling. The second section describes the instruments used in the survey and how the measures of each of the key constructs under study were operationalized, followed by the way the data is collected and processed. The last section explains the procedures of data analysis and the specific methods used to examine the research hypotheses.

3.1 Research Design

Survey and quantitative data analyses were adopted in this study as the research strategies to explore the phenomenon of place attachment in the context of open spaces in public housing areas based on the proposed theoretical framework. According to Tan (2004, p. 87), survey is suitable for exploratory, descriptive, and causal studies. Compared with other approaches, survey was considered to be more appropriate for this study because it is a systematic and relatively quick and efficient method of collecting relevant information based on a sample that can help to captures the main characteristics of the population and thus is more favorable for studies aiming at describing the population, determining associations, or establish causes (Tan, 2004, pp. 87, 98), as is the case for the current study: to capture a general picture of the various aspects of the relationships between public housing residents and their nearby neighborhood parks, to examine the factors that may affect or be affected by the development of emotional bond with neighborhood parks.

3.1.1. Research Setting

Neighborhood park was chosen from the hierarchical open space structure of Singapore's HDB new town as the research setting (Figure 3. 1). Compared with regional parks and town parks, which are large scale open spaces catering for a wider range of recreation needs of the whole town population but are located distantly from most of the residents' houses, and the precinct spaces, void deck, and between-block playgrounds, which are within immediate reach but are small scale open spaces equipped with only limited facilities, medium scale neighborhood park has sufficient space that can accommodate plenty of recreational functions which might be equal in quantity to those provided by larger open spaces and yet still it is within comfortable working distance. Local research has reported that nearby parks, especially neighborhood parks, were the most frequently visited by residents (Yuen, 1996b; Yuen & Wong, 2005, p. 270), even more frequent than adjacent rooftop gardens on multi-story car park buildings in some cases. It is argued that residents are very likely to develop special feelings toward neighborhood parks and may consequently form emotional bonds with them in the processes of using and experiencing these nearby open spaces. Thus, neighborhood parks in HDB new towns serve as ideal settings for the investigation of place attachment. Accordingly, nearby neighborhood park is considered in this study as a spatial setting which might be perceived by residents as a special "place" to which they feel emotionally attached.

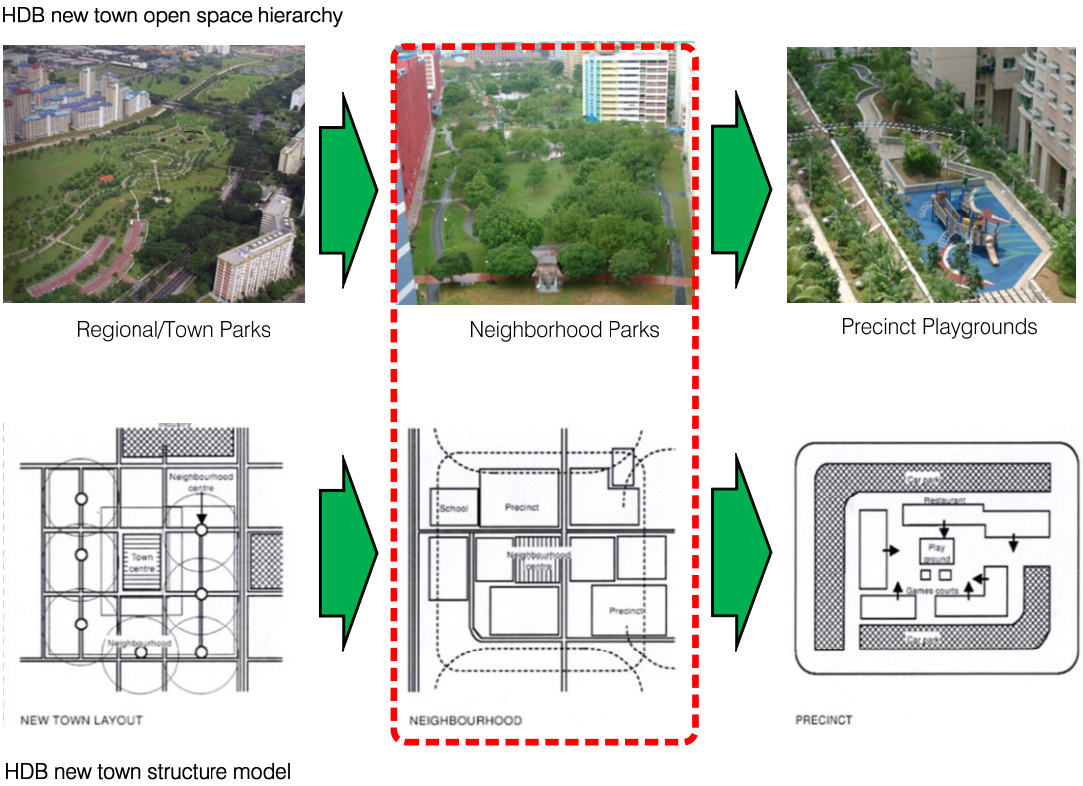


Figure 3. 1 The hierarchical structure of open spaces in HDB new towns

(Based on Yuen, 1996a, p. 963)

A total of 120 neighborhood parks (Figure 3. 2) were identified based on analysis of Singapore Master Plan 2000 [10], the Development Guide Plans (DGP) [11] published by the Urban Redevelopment Authority (URA) of Singapore, and the Singapore Street Directory 2007[12]. An inventory of neighborhood parks within HDB new towns (refer to Appendix A) was developed, which recorded some of the key information for each park, such as location, size, catchment area, population served, time of construction, etc.

Since one of the potential factors of place attachment is hypothesized to be the characteristics of the physical environment of place, an analysis of the landscape of the neighborhood parks was conducted to identify the most prominent design characteristics of these spaces which were used to guide the selection of research settings from this pool of neighborhood parks.

[10] Refer to: http://www.ura.gov.sg/ppd/gazettedmp2003/index-frontmp2003.htm
[11] Refer to: http://www.ura.gov.sg/dgp_reports/lib-dgp_report.html
[12] Refer to: http://www.streetdirectory.com/

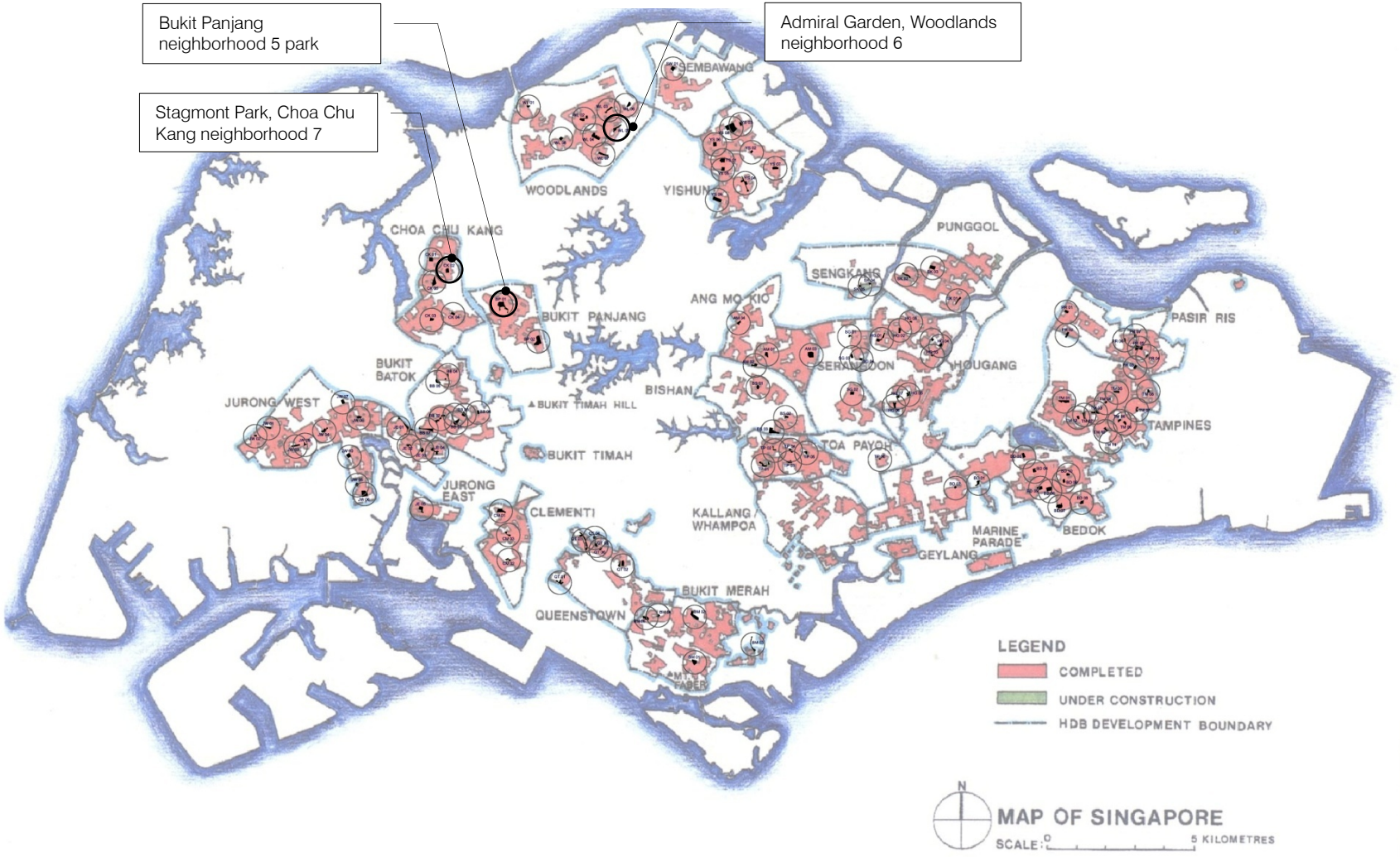


Figure 3. 2 Locations of HDB New Towns and Neighborhood Parks

Both a landscape typology and a spatial typology of neighborhood parks were identified based on analysis of aerial photos, planning drawings, on-site observation, and the neighborhood park inventory. These two typologies serve as the reference for the selection of research settings.

With regard to landscape typology, most of the HDB neighborhood parks can be classified into three categories (Table 3. 1): 1) the first type is named “Naturalistic landscape”. Parks with this type of landscape are mainly covered with dense vegetation planted in natural ways just like wild forest or woodlands with soft boundary. The winding footway or jogging trials within the parks are arranged in a less orderly way, following the undulating terrain. Recreational facilities and architectural features scatter along the meandering paths in a more or less casual way. Other natural landscape features, such as rolling terrain, stone works, and water features, are organized as natural as possible. 2) The second type is called “Geometric landscape”. The landscape features of parks belonging to this category are arranged in a strict way with clear orientation. Geometric pattern is predominant and implies obvious human intervention. Vegetations are planted orderly in either grid or radiating patterns in accordance with the pathway system. Shrubs and flowerbeds are configured also in geometric patterns. Recreation facilities and architectural features are located at strategic nodes or intersections of spatial axes to serve as landmark or focus of viewshed. 3) The third type of park is characterized by a mixture of the first two types of landscapes, thus it is named “Mixed landscape”. Vegetations planted in natural way are superimposed by geometrically configured circulation grid. The resulting composition is a mixture of design features from the first two types of landscapes. Conversely, densely planted natural landscape and geometrically arranged artificial landscape are juxtaposed together in a balanced way, resulting a collage or mosaic of distinct landscape sceneries. Neither forest-like scene nor formalistic pattern is dominant in this type of landscape.

With regard to spatial typology, the HDB neighborhood parks can be classified into six categories (Table 3. 2): 1) The first type is “centered”. Park of this type is usually located at the geometric centre of neighborhood. It is surrounded by building blocks without been interfered by primary roads. 2) The second type of park, “one-side-open”, is similar to the first but with one of its side open to primary road. 3) The third type of park, “cornered”, is located at the corner of a neighborhood area with at least two sides open to primary roads and the rest sides surrounded by building blocks. 4) The fourth type is called “linkage”, which runs across a neighborhood and links two primary roads with the rest sides defined by building blocks. 5) The fifth type is called “green buffer”, which is linear green belt or patch extended along primary road that serves as buffer zone between building blocks and car traffic. 6) The last type is “isolated”, which means that park is isolated from its nearby building blocks and is surrounded by primary or neighborhood roads with no direct ground level pedestrian linkage with surrounding areas.

Table 3. 1 Neighborhood Park Landscape Typology

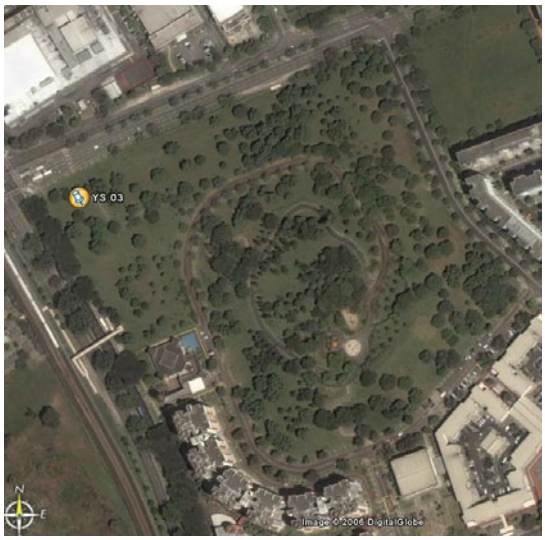
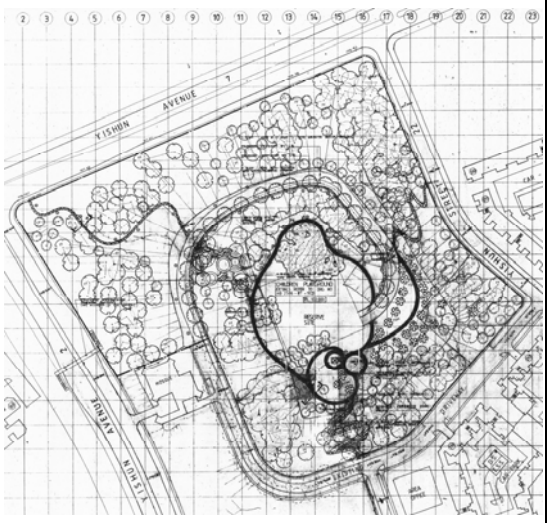
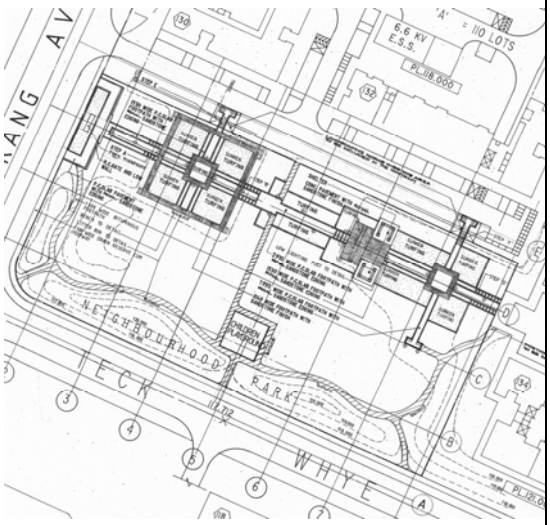
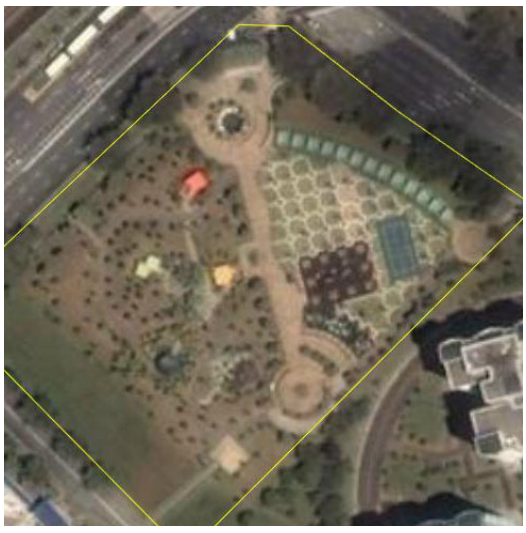
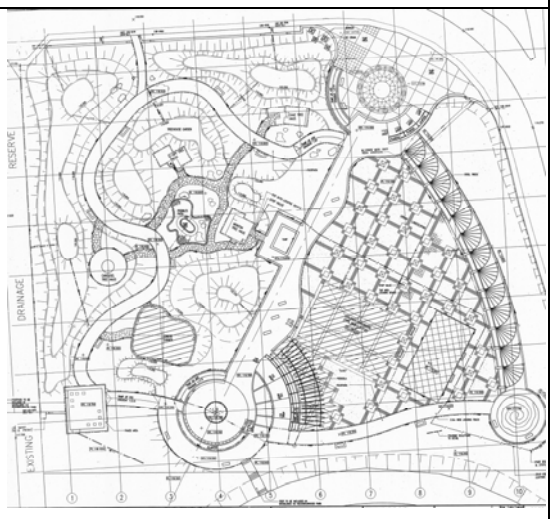
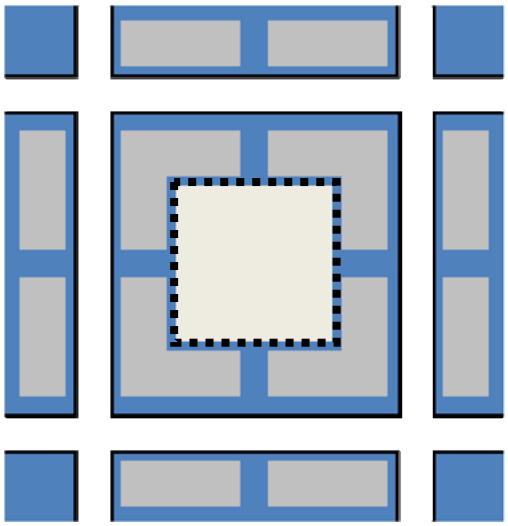
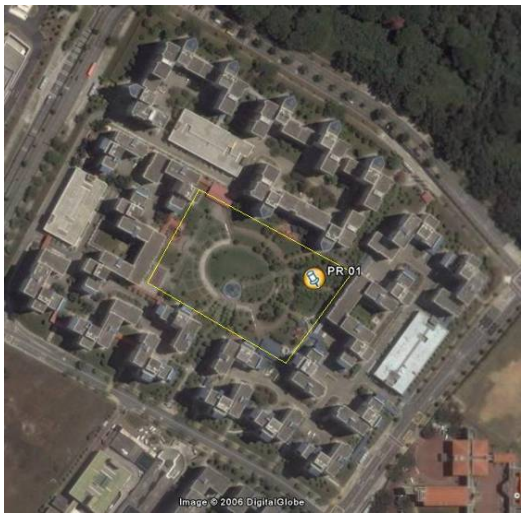
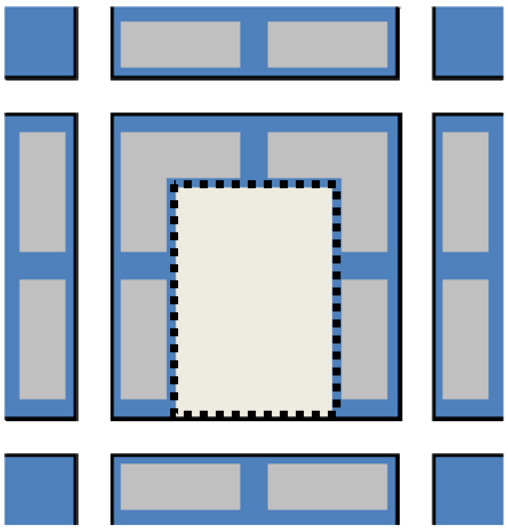
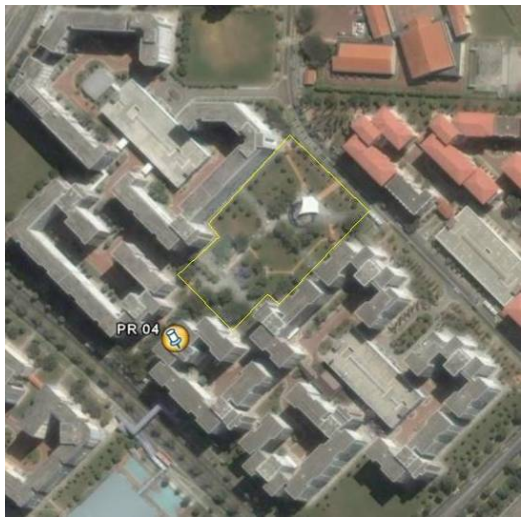
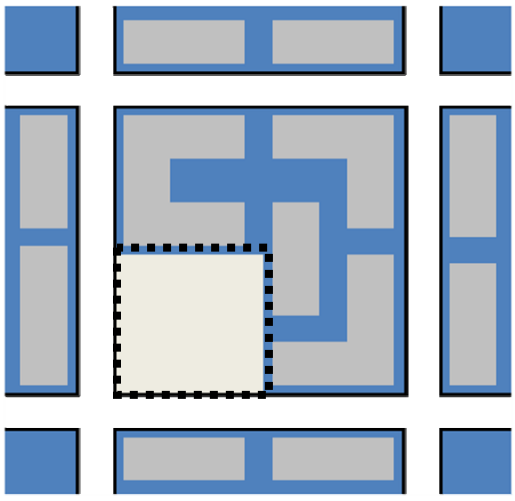
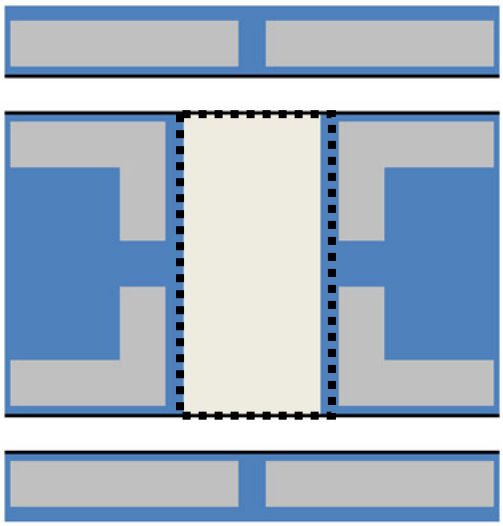
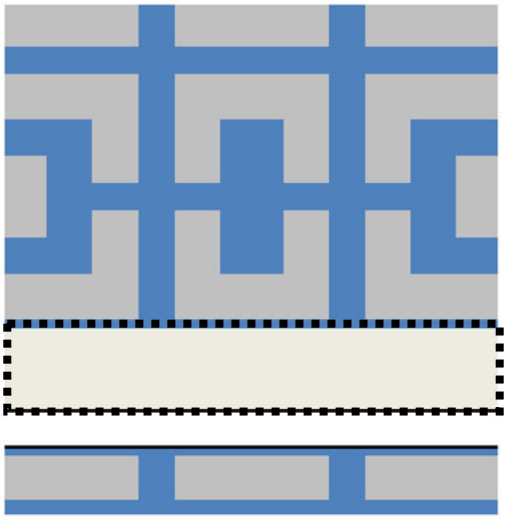
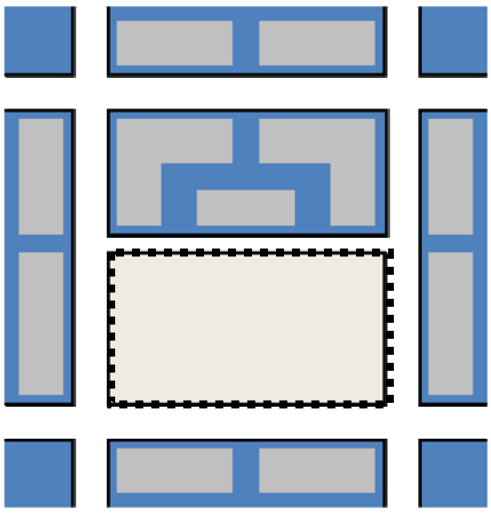
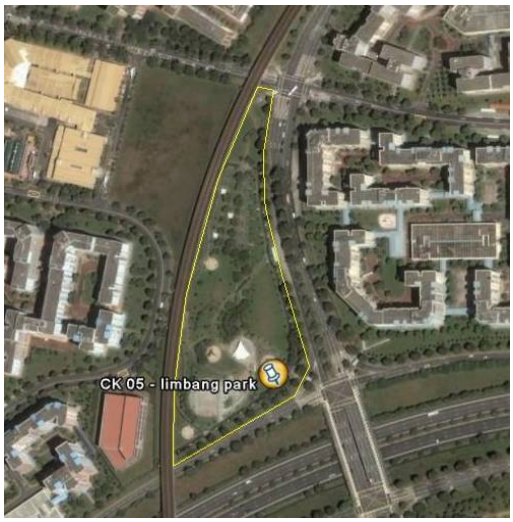
Landscape Typology (number of park)	Example design drawing
 Type I: Naturalistic Landscape (34)	 Yi Shun neighborhood 2 park
 Type II: Geometric Landscape (23)	 Choa Chu Kang n'hood 1 (Teck Whye Garden)
 Type III: Mixed Landscape (33)	 Woodlands neighborhood 3 park

Table 3. 2 Neighborhood Park Spatial Typology

Spatial Typology (number of case)	Example aerial photo
 Type A: Centered (30)	 Pasir Ris neighborhood 7 (The Green Oval)
 Type B: One-side-open (31)	 Pasir Ris neighborhood 2
 Type C: Cornered (20)	 Choa Chu Kang neighborhood 6 (Yew Tee Park)

(Continued)

Spatial Typology (number of case)	Example aerial photo
 Type D: Linkage (20)	 Pasir Ris neighborhood 7 (Brontonsaur Park)
 Type E: Green Buffer (12)	 Tampines Neighborhood 4 (Tempines North Park)
 Type F: Isolated (7)	 Choa Chu Kang neighborhood 5 (Limbang Park)

Three neighborhood parks, each representing one of the three landscape typologies as identified above, were chosen as the research settings for this study. They are Bukit Panjang Neighborhood 5 Park from Bukit Panjang new town, Stagmont Park from Choa Chu Kang new town, and Admiral Garden from Woodlands new town. These parks share similar characteristics in terms of recreation function, but they distinguish each other in terms of landscape design, urban design, architectural features, and recreational facilities. Not only are they representative of the three landscape typologies, but also they were drawn from the top three spatial typology categories that contain the largest number of cases, respectively. In other words, the three parks chosen represent the most typical landscape and spatial characteristics of neighborhood parks in HDB new towns.

Bukit Panjang Neighborhood 5 Park (Table 3. 3) is the largest among the three sites. It is located at the north side of Bukit Panjang New Town (Figure 3. 4), which covers an area of approximately 909 ha[13] with 29,498 residential flats housing 109,200 populations[14]. This park covers 4.9 ha of land with a catchment area of 92.7 ha. The number of family served in adjacent neighborhoods is around 21,258. This park is characterized by naturalistic landscape (Figure 3. 3) and it belongs to the “one-side-open” spatial typology. It is situated on top of a small hill with one side facing an adjacent water reservation pond. Most of the park is covered with densely planted matured tall trees. Rocks with moss scatter randomly on the lawn covered by fallen leaves. Asphalt jogging trails circle around the park following the rolling terrain, and most of them are shaded by the dense canopy of the trees. Many parts of the park do not have clear sign of human intervention except the lamp posts and rubbish cans, thus creating a feeling of natural woodland area. The only part that shows clear design intention is the lawn area besides the park entrance, where the ellipse-shape pathway, the centripetally located benches, and the pavilion create a relatively formal atmosphere. Most of the architectural features and recreation facilities are located on the peripheral of the park, leaving the central part relatively quiet and thus strengthening the feeling of a serene forest. The park is well connected with the surrounding building blocks with only a small within-neighborhood road running around it. Judging from the centripetal layout of building blocks around it, this neighborhood park certainly plays a central role in terms of planning. All the blocks surrounding the park are oriented toward its centre, thus maximizing the visual access to the park for as many units as possible.

Figure 3. 3 Bukit Panjang neighborhood 5 park

[13] Refer to: http://www.ura.gov.sg/dgp_reports/btpanjan/main.html
[14] Refer to: http://www.hdb.gov.sg/fi10/fi10221p.nsf/Attachment/AR0607/$file/index.htm

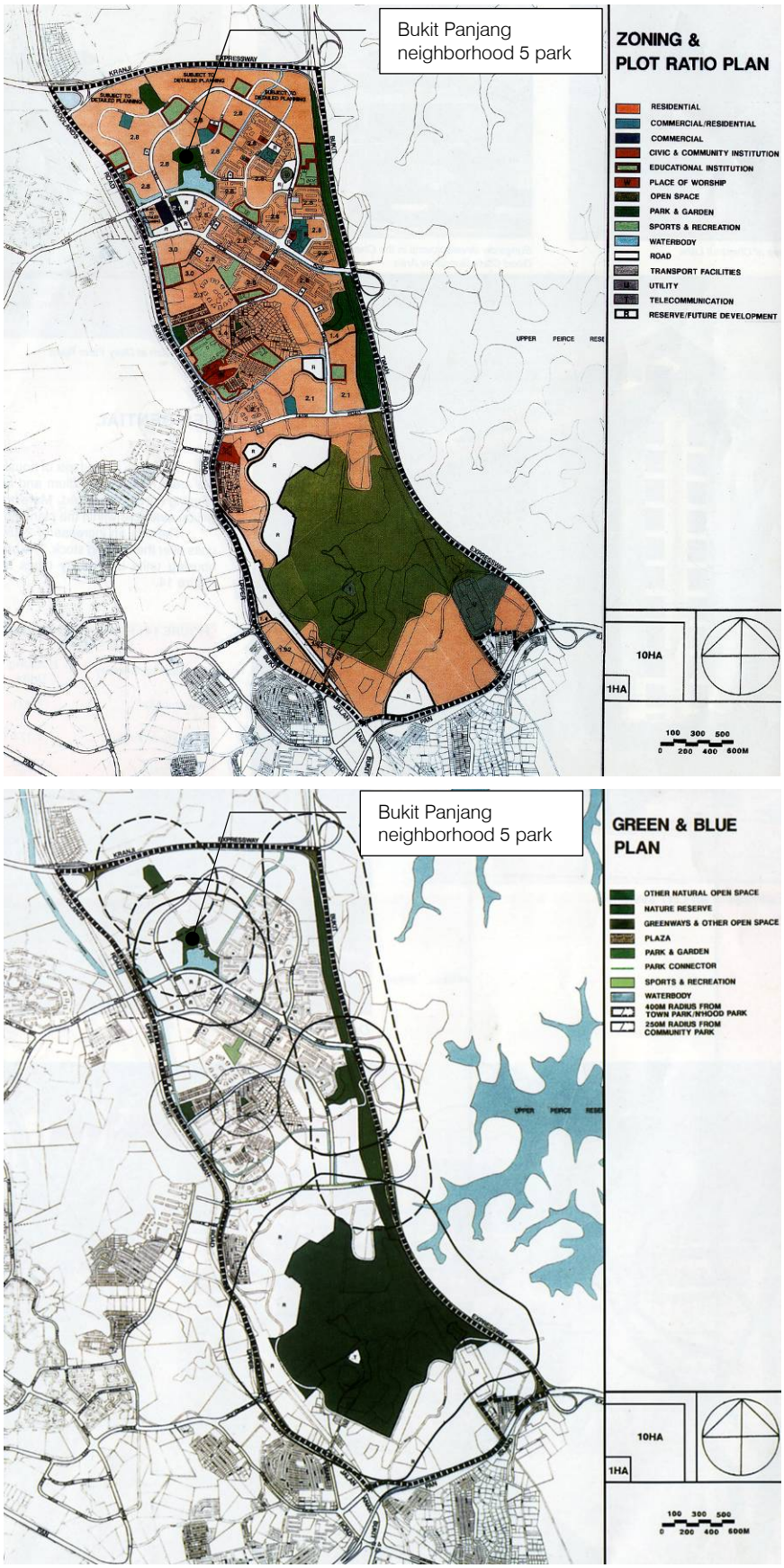
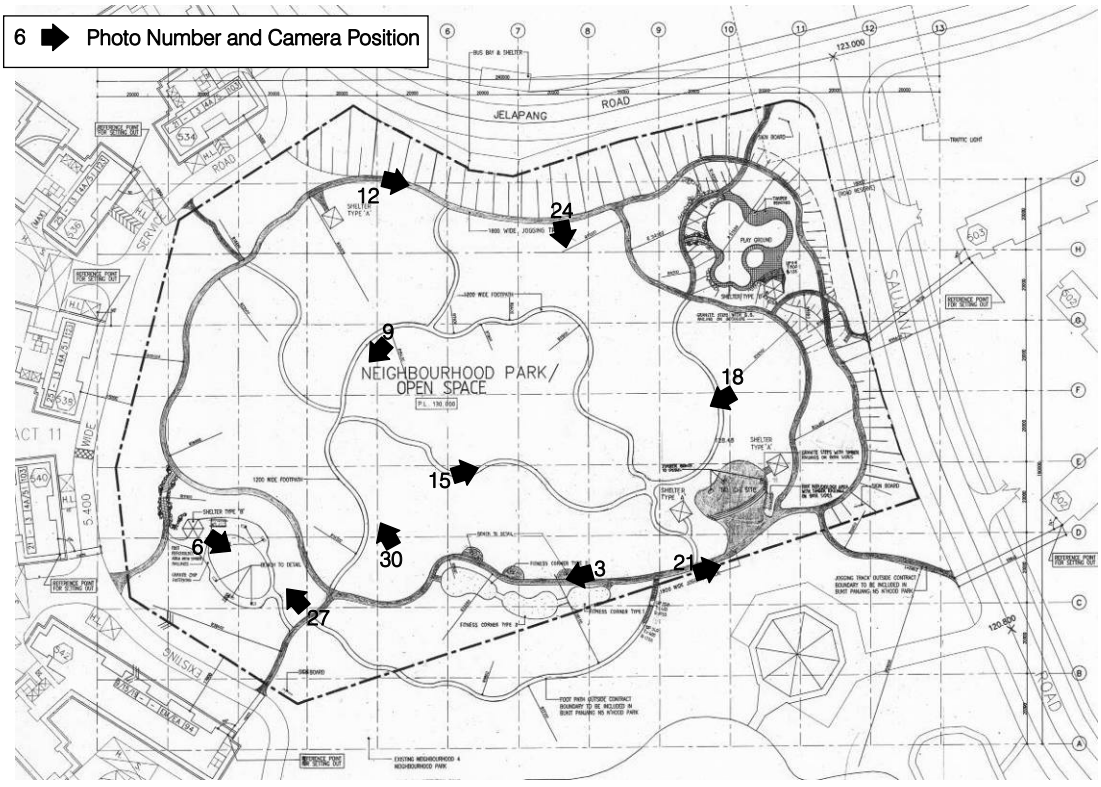


Figure 3. 4 Bukit Panjang Town and location of Bukit Panjang neighborhood 5 park

(Source: http://www.ura.gov.sg/dgp_reports/btpanjan/main.html)

Table 3. 3 Bukit Panjang Neighborhood 5 Park



Name:	Bukit Panjang Neighborhood 5 Park	Landscape Typology:	naturalistic
Area (ha):	4.9	Spatial Typology:	one side open
Catchment (ha):	92.7	Town Planning Model:	distinctive identity
Population:	21,258 families	Year of Construction:	1997

Stagmont Park (Table 3. 4) is located in neighborhood 7 of Choa Chu Kang New Town (Figure 3. 6), which covers an area of approximately 630 ha[15] with 39,173 residential units housing around 150,700 populations[16]. This park is 1.5 ha in area, with a catchment area of 27.9 ha. It serves approximately 2,936 residential units. It is characterized by a mixed landscape and it belongs to the "cornered" spatial typology. It is characterized by a mixture of geometric landscape pattern and naturalistic landscape features. Most part of the park is covered by a vacant lawn (Figure 3. 5) with several southwest-northeast oriented straight pathways and several southeast-northwest oriented curved pathways running diagonally across it, thus dividing the land into smaller plots, among which exposed earth patches scatter around like scars on the ground, creating a feeling of deserted lands. Tall trees are only planted along the pathways, leaving the vacant plots even emptier. Recreation facilities, such as basketball court, barbeque area, pavilions, fitness corner, and children's playground, are all located on the west and north sides of the park with exuberant vegetations surrounding them, creating a feeling of comfort and quietness which are in sharp contrast with the atmosphere of the vacant area. In between the recreation facilities and the vacant land is a winding dry stream which not only links the dry ponds located at the southwest and northeast corners of the park diagonally, but also is connected with most of the crossing pathways. This dry stream is a prominent design feature of the park's landscape. It is designed to imitate real stream in nature, with its edge hiding in the rocks and low bushes arranged in a natural manner. What is interesting about the design is that the bottom of the stream is not real rocks which tends to hold surface water, but is covered with concrete and a thin layer of sand so that rain water accumulated can be drained off very quickly, thus avoiding becoming a breeding place of mosquito while still maintain a naturalistic appearance. Considering the specific climatic condition and landscape traditions of this region, the dry stream design is a wonderful example of a fine balance between aesthetic appeals, landscaping technologies, and hygiene requirements. On site observation did find that the dry stream not only attracted plenty of adults to come to enjoy the scenery, but also attracted many curious children to explore the ever-changing landscape by digging and searching around it. The park is located at one corner of a neighborhood area, with the Choa Chu Kang Street 54 running along its west and north boundary. Ground level access to the park is convenient. According to the design drawings, this park was planned and constructed in 1994. The buildings around the park are the oldest among the three neighborhoods under study.

Figure 3. 5 Stagmont Park in Choa Chu Kang neighborhood 7

[15] Refer to: http://www.ura.gov.sg/dgp_reports/choachuk/main.html
[16] Refer to: http://www.hdb.gov.sg/fi10/fi10221p.nsf/Attachment/AR0607/$file/index.htm

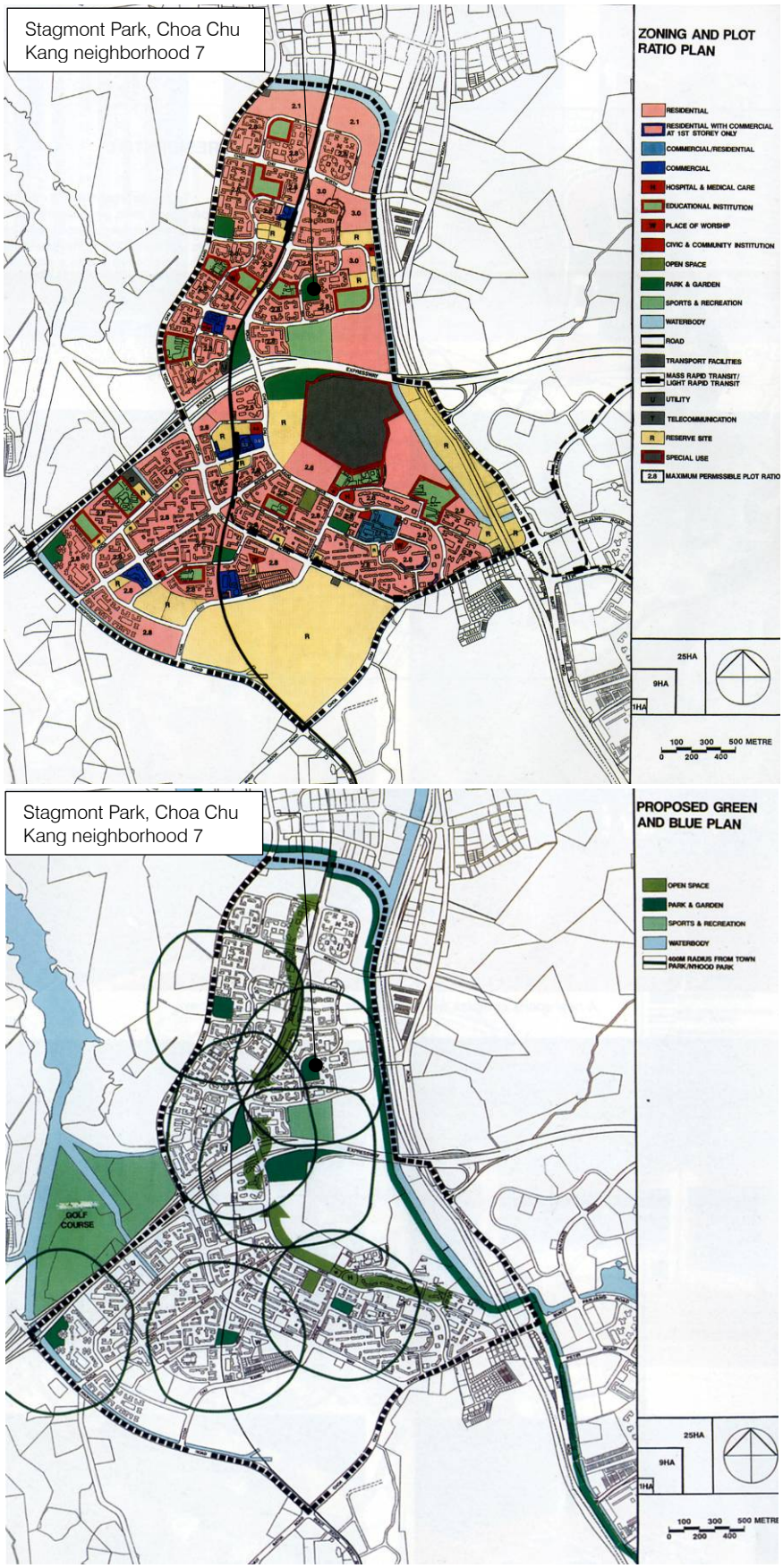
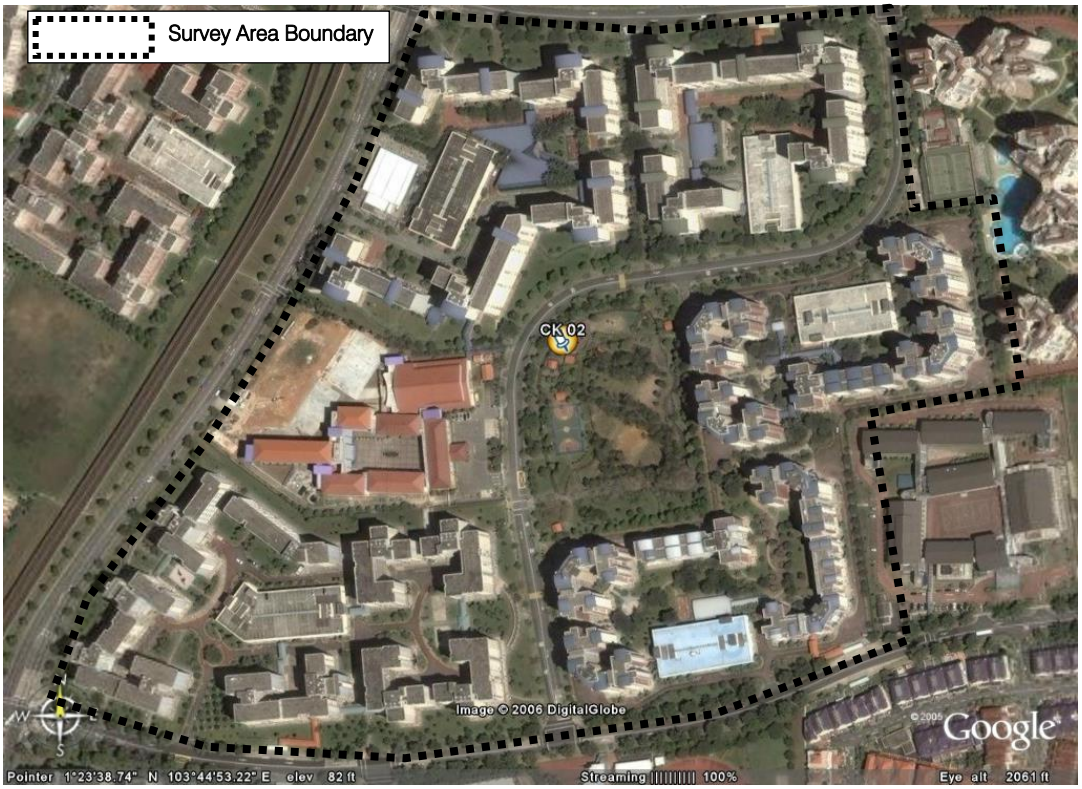
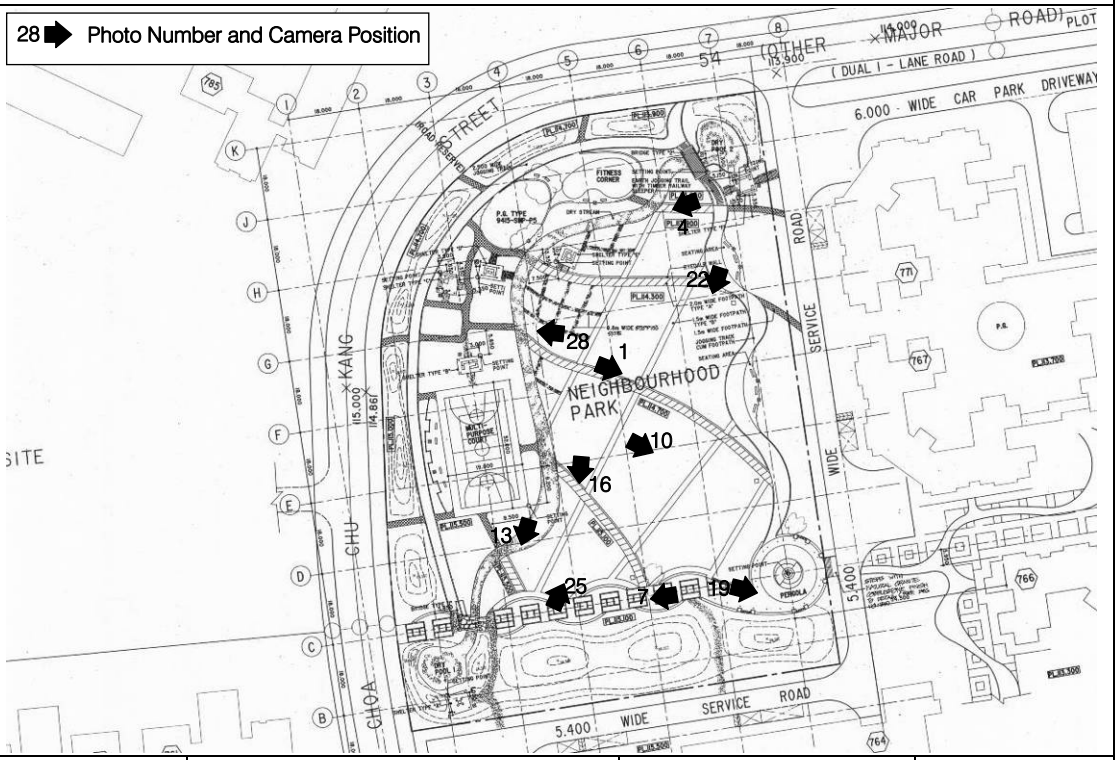


Figure 3. 6 Choa Chu Kang Town and location of Choa Chu Kang neighborhood 7 park

(Source: http://www.ura.gov.sg/dgp_reports/choachuk/main.html)

Table 3. 4 Choa Chu Kang Neighborhood 7 Park





Name:	Choa Chu Kang neighborhood 7 park	Landscape Typology:	mixed
Area (ha):	1.5	Spatial Typology:	corner
Catchment (ha):	27.9	Town Planning Model:	distinctive identity
Population:	2,936 families	Year of Construction:	1994

Admiral Garden (Table 3. 5) is located in neighborhood 6 of Woodlands New Town (Figure 3. 8), which covers an area of approximately 1,360 ha[17] with 57,953 residential units housing around 219,300 populations[18]. Its 1.6 ha area is a bit larger than Stagmont Park. Within its 61.2 catchment area, it serves approximately 9,505 residential units. The geometric landscape pattern is salient for Admiral Garden. Running along one side the triangular-shape park are two parallel straight pathways, whose east end is the entrance plaza of the park and the west end points toward a large fan-shape tent (Figure 3. 7). Palm trees are planted in an orderly manner along the pathways. As the landmark of the whole park, the tent is prominent in terms of location and physical characteristics. It can be seen from nearly every direction, and it creates the only large area with good shading in the park, whereas most of the rest parts of the park are covered with either lawn or newly planted palm trees or shrubs that are unable to create enough cool shades along the trails. Radiating stone pavements create an interesting concentric ground pattern around the tent, pushing one of the straight pathways aside and turning it into curved trail, along which recreation facilities are arranged. Most of the trees and shrubs are still young, and they're not planted in a concentrated way, thus line of sight can penetrate most sections of the park without being blocked by vegetation. This park is located at the centre of the neighborhood area, without being isolated by car traffic from the surrounding building blocks. Thus, it can be easily accessed by nearby residents. According to the design drawings, this park was planned and constructed in 1996.

Figure 3. 7 Admiral Garden in Woodlands neighborhood 6

[17] Refer to: http://www.ura.gov.sg/dgp_reports/wdlands/main.html
[18] Refer to: http://www.hdb.gov.sg/fi10/fi10221p.nsf/Attachment/AR0607/$file/index.htm

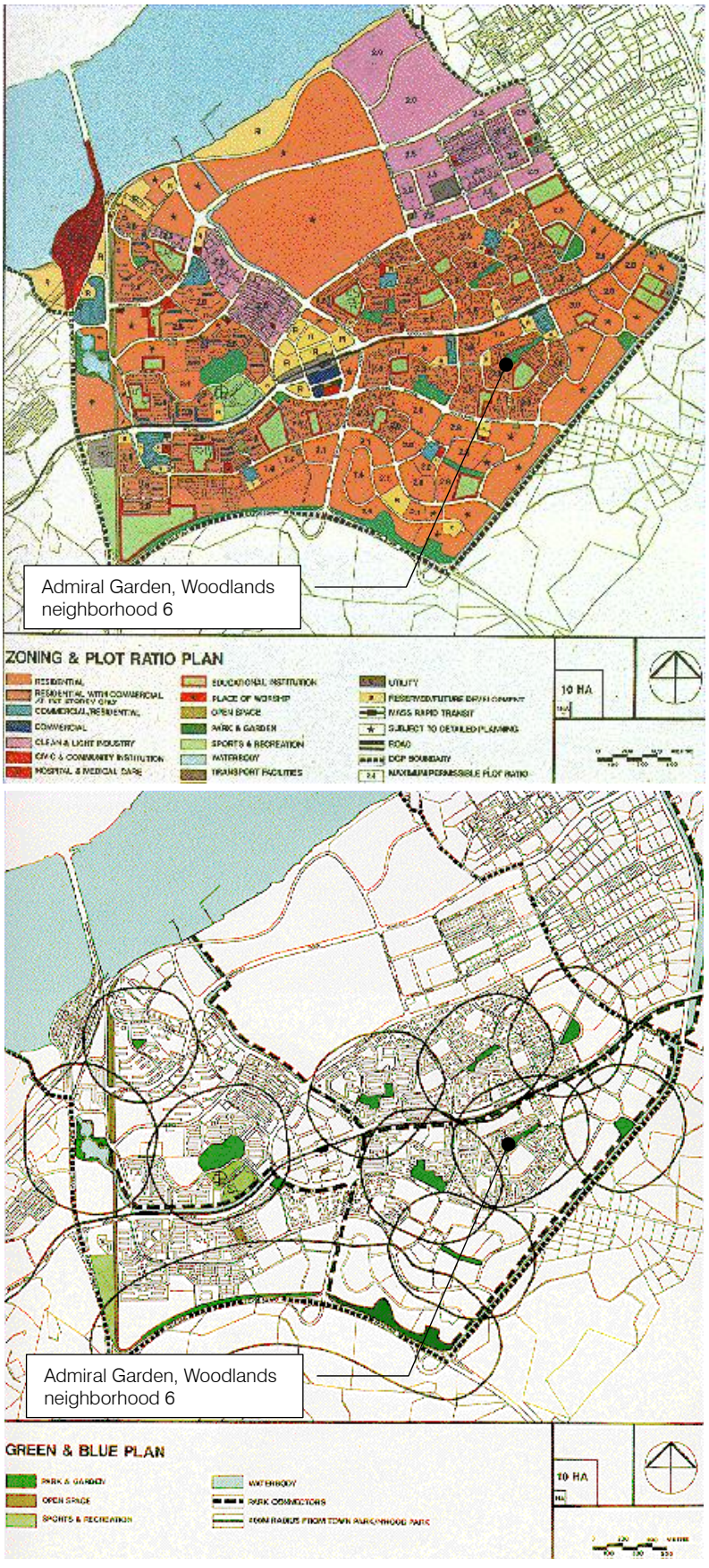
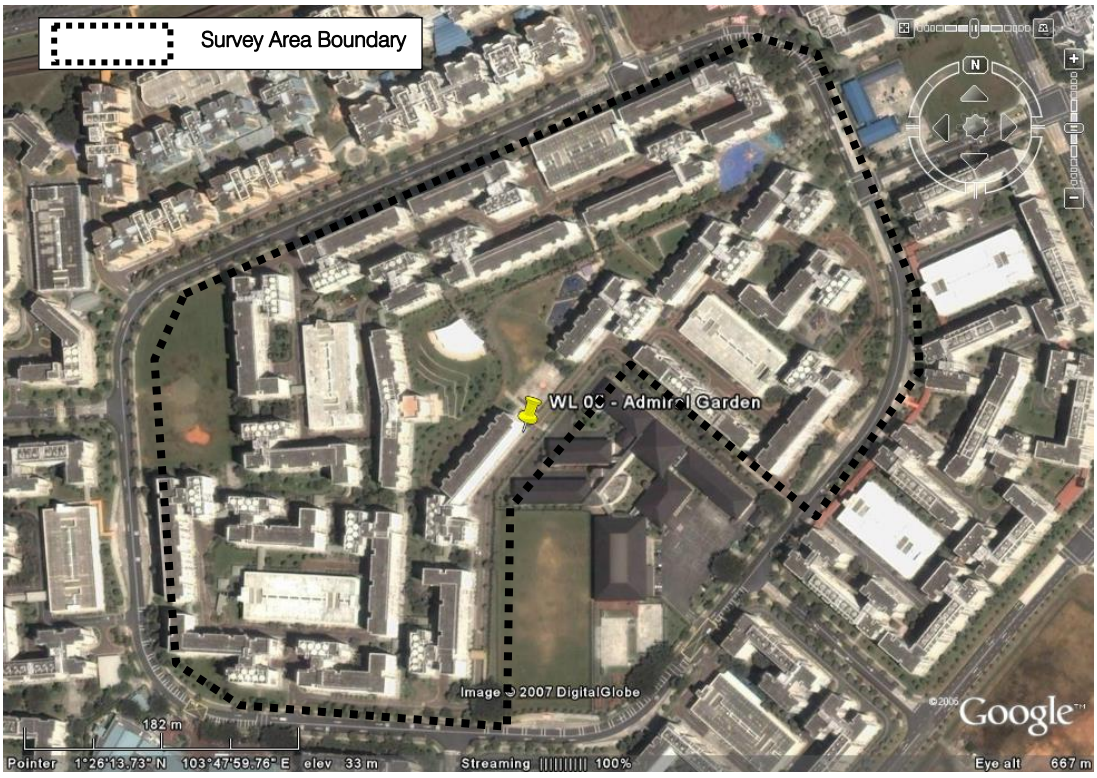
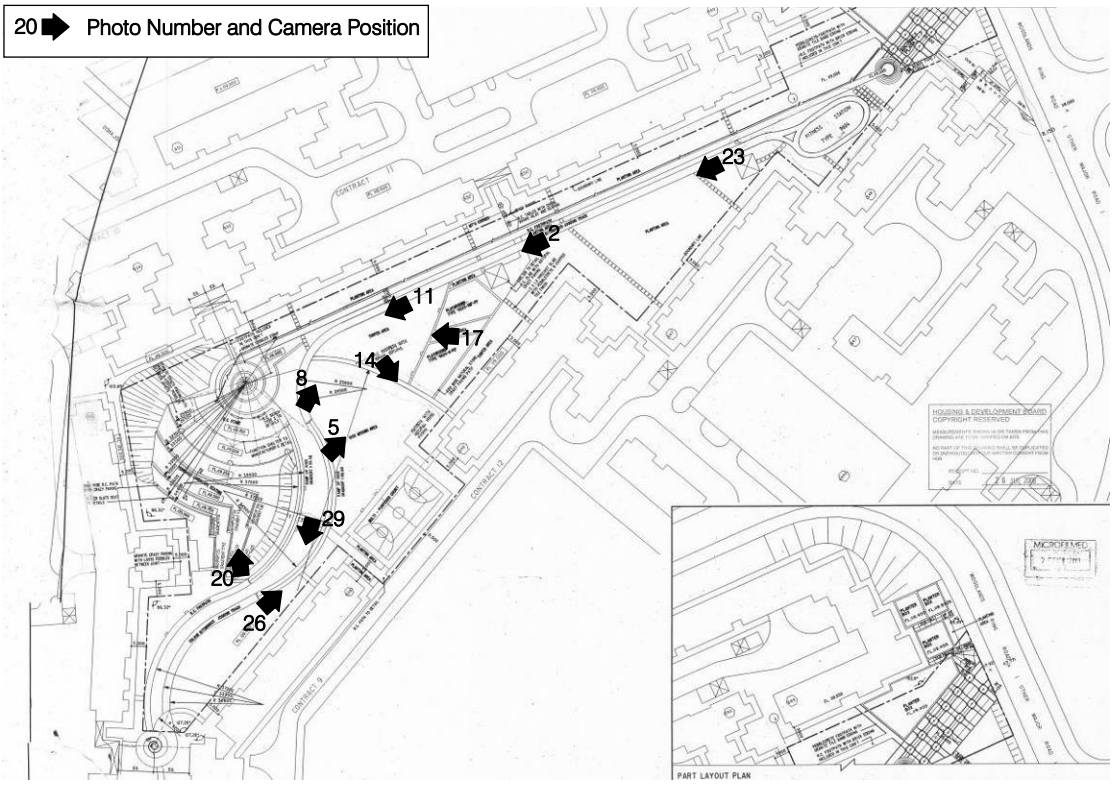


Figure 3. 8 Woodlands Town and location of Woodlands neighborhood 6 park

(Source: http://www.ura.gov.sg/dgp_reports/wdlands/main.html)

Table 3. 5 Woodlands Neighborhood 6 Park

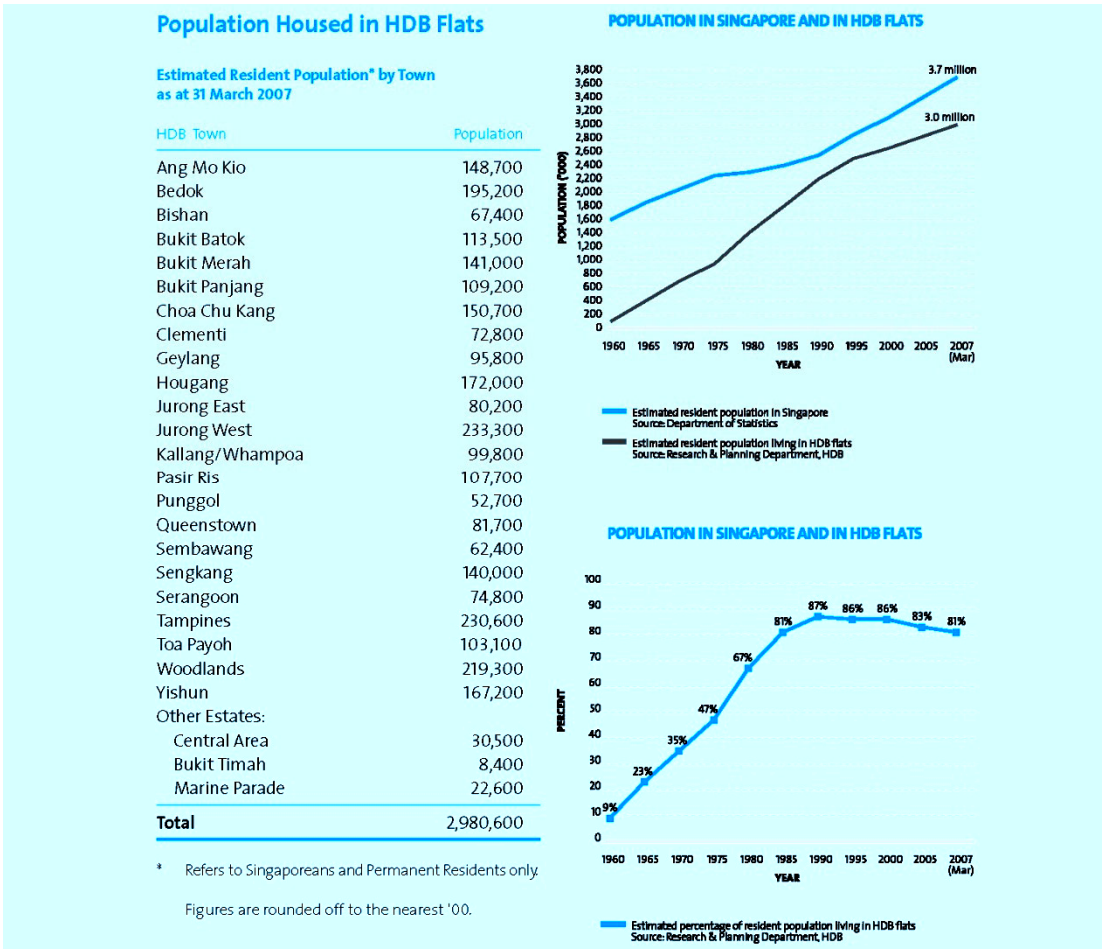




Name:	Woodlands neighborhood 6 park	Landscape Typology:	geometric
Area (ha):	1.6	Spatial Typology:	centered
Catchment (ha):	61.2	Town Planning Model:	Neighborhood concept
Population:	9,505 families	Year of Construction:	1996

3.1.2. Sampling

Currently, more than 80% of Singapore's population is accomodated in public housing estates of the 23 HDB new towns and other areas (Figure 3. 9). The purpose of this study is to investigate public housing residents' attachment to nearby neighborhood parks. Therefore, according to Tan's (2004, p. 88) suggestion, a sampling framework was proposed (Figure 3. 10), in which residents living near the parks rather than actual park visitors or users were defined as composing the sampling frame. Residents were surveyed at their doorstep so that infrequent, off-site and non-users who may otherwise have been missed in an on-site visitor survey can be included.



Population Housed in HDB Flats

Estimated Resident Population* by Town as at 31 March 2007

HDB Town	Population
Ang Mo Kio	148,700
Bedok	195,200
Bishan	67,400
Bukit Batok	113,500
Bukit Merah	141,000
Bukit Panjang	109,200
Choa Chu Kang	150,700
Clementi	72,800
Geylang	95,800
Hougang	172,000
Jurong East	80,200
Jurong West	233,300
Kallang/Whampoa	99,800
Pasir Ris	107,700
Punggol	52,700
Queenstown	81,700
Sembawang	62,400
Sengkang	140,000
Serangoon	74,800
Tampines	230,600
Toa Payoh	103,100
Woodlands	219,300
Yishun	167,200
Other Estates:	
Central Area	30,500
Bukit Timah	8,400
Marine Parade	22,600
Total	2,980,600

* Refers to Singaporeans and Permanent Residents only.

Figures are rounded off to the nearest '00.

Figure 3. 9 Demographic statistics of HDB residents

(Source: HDB Annural Report 06/07)[19]

Previous research indicates that distance or walking time from the home appears to be one of the most important predictors for use of green spaces (Grahn, 1991). Local researcher also found that majority of the users live within 200m or less from the neighborhood parks (Ooi, 1992, p. 72). Thus, in this study, survey was only conducted in the HDB blocks within the 200-meter catchment area of the three neighborhood parks under study (Table 3. 3 - Table 3. 5). Within each of the three survey areas, a stratified random sampling process was used to obtain a representative sample of HDB residents (Herzog, 1996, p. 125). In other words, the sampling

[19] Refer to: http://www.hdb.gov.sg/fi10/fi10221p.nsf/Attachment/AR0607/$file/index.htm

process was carried out so that the key demographic characteristics of respondents can closely reflect the demographic profile of HDB residents in general. The stratification variables used to guide the sampling are age, gender, and ethnicity, and the strata or the proportions of sample for each stratification variable were based on the demographic profile of HDB residents (15 and older) published by the HDB authority (Fong, 2005).

Part of the analysis of this study involved the use of structural equation modeling, a statistical analysis technique demanding large sample. According to Kelloway (1998), for models incorporating latent variables, a sample size of 100 or more is recommended. Thus, to meet the minimum sample requirement, more than 100 residents were surveyed in each of the three neighborhood areas under study.

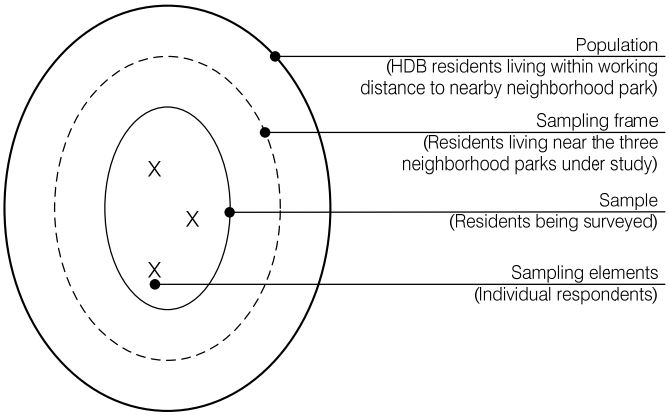


Figure 3. 10 Sampling framework

3.2 Data Collection

3.2.1. Instrument

A ten-page self-administrated verbal-questionnaire (refer to Appendix B & C) containing 18 questions was constructed for the HDB residential survey to explore the relationships between residents and their nearby neighborhood park. The questionnaire begins with a cover letter which explains to the residents the purposes, the contents, and the meaning of the survey. The questions contained in the questionnaire covers fourteen areas of inquiry, each of whom concerns a specific aspect of the relationships between residents and neighborhood parks, and corresponds to a specific research domain as suggested in the research framework. The relationships between the areas of inquiry as explored through specific questions in the questionnaire and the research domains are explained in Table 3. 6. Operationalization of the constructs of interest is described in the following section.

Table 3. 6 Relationships between the components of the survey questionnaire and the research framework

Part	Concept Domains in the Research Framework	Areas of Inquiry in the Questionnaire	Question Number(s)
I	Place perception	Park landscape preference	photo rating
		Perceived uniqueness of park design features	6
II	Place experience	Park activities, alone or with family	1
		Park-based social interactions	2
		Park use motivations	4
III	Place satisfaction	Park quality evaluation	7
IV	Place meanings	Identification with park meanings	5
V	Place attachment	Park attachment	3
VI	Place-related attitudes and behaviors	Preferences for park upgrade proposals	8
		Responses to hypothetical negative park changes	9
		Willingness to participate in park-related activities	10
VII		Neighborhood attachment	11
VIII		Importance of neighborhood park in residents' life	12, 13, 14, 15
IX	Socio-demographic characteristics	Respondents' socio-demographic information	16, 17, 18

3.2.2. Measurement

I. Place Perception

The first part of the questionnaire concerns the characteristics of the physical environment of neighborhood parks as perceived by residents. It contains two questions. The first question involves a photo rating task which aimed at exploring residents' preferences for neighborhood park landscapes (refer to next section for the construction of photo-questionnaire). The purpose of adopting preference rating approach in this study is not only to find out the most and least preferred landscapes through respondents' aesthetic appraisals of the environmental surrogates, but also to identify, through factor analysis, the categories of park environment that are perceived by residents as different from each other in landscape characteristic. Participants were asked to rate each of the selected thirty photographs according to how much they like the scene presented in the picture using a 7-point scale, ranging from "1=not at all" to "7=very much". The question was asked in a general way without requiring the respondents to relate it to specific elements or functions of the landscape depicted in each photograph.

The second question investigates the perceived uniqueness of the physical environment of park. Previous research has pointed out that the perceived quality of outstanding and unequaled, i.e. the "uniqueness" of one's local environment, may contributes to individuals' intense and positive psychological bonds with the locale (Firey, 1945; Guest & Lee, 1983, p. 164). Although neighborhood parks lack those dramatic landscapes typical of wildness areas or tourism sites, they do contain a lot of specifically designed features which reflect the designers intentions to create distinct identities. Thus, it is necessary to find out what design features which the residents may regard as distinct from other open spaces are and to what extent these physical characteristics are perceived as unique. Moreover, as Kaplan and Kaplan (1989, p. 26) noted that the landscape categories identified in landscape preference studies can be roughly divided

into two types: one is called “content-based” categories which are characterized by “specific objects or elements” contained in the landscape surrogates, and the other is called “spatial configuration” categories. What the images within the latter category have in common is “the way the elements are arranged in the implied space of the scene” (Kaplan & Kaplan, 1989, p. 26). Accordingly, seventeen items, which concern not only specific design features existing in these neighborhood parks, either natural or artificial, but also ways of spatial organization of these design elements, were included in this question. Examples of items denoting design features are “landform”, “various plant species”, and “buildings, pavilions, tents, and pergolas”. Examples of items concerning spatial organization are “The way the vegetation are organized and planted” and “The way the paths and jogging trails are laid out”. Participants were asked to indicate the extent to which they think each of the seventeen items is unique in comparison with other parks using a 5-point scale, ranging from “1=Not at all” to “5=Extremely”.

II. Place Experience

The second part of the questionnaire concerns the interactions between residents and their nearby neighborhood park, and it contains three questions. As argued in Chapter Two, place-based experiences as results of people-place interactions are important sources of place meanings and place attachment. In this study, two questions were constructed to gauge the typology and the intensity of respondents’ park-based experiences.

The first question requires the residents to indicate their frequency of taking part in a series of park-based activities alone or with their family members on a 5-point scale, ranging from “1=Seldom, once a year or less” to “5=Frequently, almost every day”. Thirteen items, ranging from active recreations such as “Jogging” and “Exercise at the fitness corner” to passive recreations such as “Strolling around” and “Taking a rest inside the pavilion”, were included in this question in an attempt to capture a wide spectrum of recreation activities which might be carried out by the residents in neighborhood parks,

Respondents were also asked to indicate how often they use the nearby neighborhood park for recreation with their friends or neighbors specifically, since the literature has suggested that socialization is an important factor of attachment, and attachment to a place is also reflected in the emotional ties to specific social relationships developed in the place.

Spatial-setting-based social interactions or locality-based social ties, rather than individuals’ general social networks, which might not require the support of specific physical environment, are of interest in this question. The rationale here is that physical environment provides the setting against which the spatial-setting-based social interactions are carried out, thus the meaning derived from these types of social interactions will be closely associated with the physical setting and become one of the sources of place attachment.

The items included in this question are different from that of the previous one, in that they concern only park-based activities that involve interaction with other people. Examples of the eleven items used are “Chatting”, “Playing football/basketball/tennis/badminton”, and “Join community activities”. Respondents were asked to rate each item on the same 5-point scale as

the previous question.

The third question belonging to this section is concerned with residents' motivation of using the nearby neighborhood park. Participants were asked to indicate the extent to which they agree with each of the ten statements on a 5-point Likert scale, ranging from "1=Strongly disagree" to "5=Strong agree". These ten statements describe a variety of possible reasons to use nearby neighborhood park, such as socialize with other people, do physical exercise, obtain psychological relief, and be with family members.

III. Place Satisfaction

The third part of the questionnaire contains one question examining residents' park satisfaction. Place satisfaction, or subjective evaluative beliefs toward a place, may affect the development of place attachment. To examine how residents' perceived condition of the park environment may be associated with their attachment to the park, residents' levels of satisfaction with their nearby neighborhood park are measured through their assessments of park quality. Participants were asked, "How will you evaluate the quality of your neighborhood park in following aspects?" Eighteen items were included in this question. Measured on 5-point bipolar scale with lower value indicating poorer quality and greater value better quality[20], these items concern a variety of aspects of the park environment, such as visual quality, maintenance, orientation, connectivity, safety, functionality, and environmental quality. Participants were also asked to give a general evaluation of the overall park quality based on a 5-point scale, ranging from "1=Very poor" to "5=Excellent".

IV. Place Meanings

The fourth part of the questionnaire concerns the meanings attributed to neighborhood parks. As argued in Chapter Two, place is a meaning-based concept. The extent to which an individual identifies with the meanings attached to a place may have substantial impacts on the degree of his or her attachment to that place. Place meaning is defined in this study as the perceived essence of a spatial setting, or what a place stands for or symbolizes basically.

In order to explore what the nearby neighborhood park means to the HDB residents and the extent to which the residents identify with these meanings, participants were asked, "What kind of place do you think your neighborhood park is, basically?" Based on literature review and, especially, local research and documents related to open space planning and design in Singapore, eleven items were included in this question in an attempt to capture a wide variety of meanings of neighborhood parks that might be agreed upon by residents. These items concern not only the meaning of nearby neighborhood park to individual's personal well-being and social life, such as "a place for recreation", "a socializing place", and "a quiet and peaceful place to stay alone", and that to the community, such as "a platform of my community life" and "a representation of the neighborhood I live in", but also the meaning of neighborhood parks to the nation and to the global environment, such as "a representation of 'the Garden City of

[20] Example of bipolar scale:

The park is very noisy	1	2	3	4	5	The park is very quiet
The park is very dirty	1	2	3	4	5	The park is very clean

Singapore'", "a part of the city's overall green open space network", "an urban forest", and "a part of the natural eco-system of the earth". Two images of neighborhood park that might be perceived by residents as negative were also included, one is "a place that has been forgotten by residents", the other is "a place that nobody would like to go". The items recruited to explore the diversity of meanings ascribed to neighborhood parks were not to be exhaustive but representative. Participants were asked to indicate the extent to which they agree with each of the eleven statements about neighborhood park meanings using a 5-point Likert scale, ranging from "1=Strongly disagree" to "5=Strongly agree".

V. Place Attachment

The fifth part of the questionnaire explores the key construct of this study, place attachment. As argued in the research framework, place attachment is a positive emotional bond between individuals or groups and place. It is considered as a multidimensional construct composed of three dimensions, place dependence, place identity, and place caring.

In order to examine the dimensionality of attachment feeling toward neighborhood park, fifteen items were proposed as measures of the hypothesized three-dimension structure of place attachment, five for each dimension[21]. The items used to measure park dependence and park identity dimensions are constructed based on previous attachment studies (Williams, Andersen, et al., 1995; Williams & Roggenbuck, 1989; Williams & Vaske, 2003) that have tested systematically the validity and reliability of these items, and the wording of these items was modified to suit the current research context.

Park dependence items emphasize the utilitarian meanings of neighborhood park to individuals and low possibility of substitution. Example statements used are "This park is the best place for what I like to do", "I get more satisfaction out of visiting this park than from visiting any other parks", and "Doing what I do in this park is more important to me than doing it in any other place". Park identity items stress the significance of neighborhood park in enhancing a person's self-identity and the deep emotional bonding between individual and park. Example statements are "I feel this park is a part of me", "Visiting and using the park say a lot about who I am", and "I feel I am deeply connected with the park emotionally".

The items used to indicate park caring dimension were constructed based on previous research that has investigated the caring and concern aspects of the emotional ties between people and place, such as Shamai (1991) and Kaltenborn's (1998) work. As argued in the research framework, place attachment implies not only functional reliance on place, strong self-identity in reference to place, but also feelings of caring about place, curiosity about place, and commitment to place. Place caring may be characterized by desire to know about the past, the status quo, and the future of a place, as is exemplified the statements such as "I would like to know the history of this park", "I always pay particular attentions to the changes happening to this park", and "It is important for me to know how this park will be redesigned and redeveloped by the authority in future". Place caring may also be reflected in expressed personal concern

[21] According to Williams and Vaske (2003, p. 838), little improvement can be obtained with regard to the generalizability (reliability) of a scale by increasing the number of items used to measure each dimension of place attachment beyond five or six.

about place and willingness to engage in place, as is exemplified by statements such as “I care about the neighborhood park very much”, “I would be willing to invest my time and energy on activities related to this park”.

These three groups of items were arranged in an alternating manner so that no two items designed to examine the same dimension are presented consecutively. Participants were asked to indicate the extent to which they agree with each of the fifteen statements when they were asked, “What are your feelings to the nearby neighborhood park?” using a 5-point Likert scale, ranging from “1=Strongly disagree” to “5=Strongly agree”.

VI. Place-related Attitudes and Behaviors

The sixth part of the questionnaire examines park-related attitudes and behaviors. As elucidated in the research framework, being attached to a place is not the end of the whole psycho-social process of people-place bonding. Place attachment may imply subsequent attitudinal inclinations and behavioral intentions related to place that may tend to protect the emotional ties between individuals and place from being disrupted and broken when it is threatened. Being attached to a place may also imply attitudes and behaviors which welcome design and management strategies that may foster or enhance distinct identity of the place and that may imbue the place with special meanings.

Attitudinal implications of attachment to neighborhood park was explored through examining residents attitudes toward park design and management strategies, which were measured via their responses to a series of park upgrade proposals. Thirty five items were included in this question. These hypothetical proposals are concerned with a wide variety of aspects of neighborhood park environment, such as active recreation, maintenance quality, local commercial development, aesthetic quality, passive recreation, facilities, environmental quality, safety, regulation, orientation, connectivity, ecological quality, cultural connotations, and educational functions. Participants were asked to indicate the extent to which they agree with each of the thirty five proposals on a 5-point Likert scale, ranging from “1=Strongly disagree” to “5=Strongly agree”.

Behavioral implication of attachment to neighborhood park was explored through examining how residents might respond to hypothetical park changes which might be regarded by them as unsatisfactory or unacceptable. The rationale is that people may not be aware of their deep emotional bonds with a place until it is threatened by rapid and, most often, undesirable transformations. These negative changes might result in negative personal feelings, and they also might encourage individuals to take actions to fight against the changes. Ten items were included as possible reactions, ranging from feeling personal loss and sad, stopping using the park and seeking for alternatives, to becoming actively engaged in park-protective activities. Participants were asked to indicate the extent to which they agree that they will behave like each of the statements suggests using a 5-point scale.

Behavioral implication of attachment was also explored through assessing residents’ willingness to participate in park-related activities. The four items included in this question were proposed in

an attempt to examine the degree to which residents may be willing to engage in community activities which are relevant to how neighborhood parks are designed, managed, and used, such as attending public meetings to intervene the design process, sharing the cost of park improvement, joining park maintenance work, and working in community gardens designed and maintained by residents themselves. The four items were measured on a 5-point scale ranging from "1=Not at all" to "5=Extremely". Some of the questions used in this section of the questionnaire are constructed based on previous studies by Robert Ryan (1997, 2005).

VII. Neighborhood Attachment

The seventh part of the questionnaire explores the emotional ties between residents and their neighborhood. It is assumed that residents' attachments to their respective neighborhood parks, an important component of the neighborhood environment, may contribute to their attachments to the neighborhood as a whole. In other words, residents' identification with neighborhood park may strengthen their identification with the neighborhood as a meaningful and inseparable setting of their life. Based on previous research (Mesch & Manor, 1998; Shumaker & Taylor, 1983), nine items were included as measure of neighborhood attachment. These items are statements that concern not only subjective evaluation of the neighborhood environmental qualities such as "This neighborhood can satisfy most of my needs", but also affective affiliations with and emotional bonds to neighborhood such as "I feel I am deeply connected with this neighborhood". Participants were required to indicate the extent to which they agree with each of the nine statements when they were asked, "What are your feelings toward the neighborhood in which you live now?" using a 5-point Likert scale, ranging from "1=Strongly disagree" to "5=Strong agree".

VIII. Importance of Neighborhood Park in Residents' Life

The eighth part of the questionnaire explores the relative importance of neighborhood parks in the HDB residents' everyday life in comparison with other aspects of the neighborhood environment and other urban design elements.

In order to explore the relative importance of the neighborhood parks in residents' recreation life, participants were asked to indicate the frequency of using their respective neighborhood park and a variety of other public spaces (Figure 3. 11). These public spaces include not only open spaces within HDB new towns such as smaller precinct playgrounds and bigger town parks, but also open spaces catering for the whole urban populations such as urban nature reserves (e.g. Bukit Timah nature reserve), coastal parks (e.g. Pasir Ris Park), off-coast islands (e.g. Pulau Ubin), city-center open spaces (e.g. Mount Faber Park), theme parks (e.g. Jurong Bird Park), historical and memorial parks (e.g. Fort Canning Park), and waterfront open spaces (e.g. Marina Promenade). A 5-point Liker scale were used, ranging from "1" indicating "Seldom – once a year or less" to "5" indicating "Frequently – almost every day".

Participants were also asked to indicate: the extent to which they think their respective neighborhood parks and other facilities and design elements are helpful in recognize their own neighborhood using a 5-point scale ranging from "1=Not helpful at all" to "5=Very helpful"; the frequency of meeting neighbors or friends at neighborhood park and other locations within their

respective neighborhoods using a 5-point Liker scale, ranging from “1=Never” to “5=Very frequently”; and the extent to which they agree that parks and landscaped open spaces, among a variety of other issues, are the reasons for them to choose to live in their current HDB flat using also a 5-point Likert scale ranging from “1=Strongly disagree” to “5=Strong agree”.

IX. Socio-demographic Characteristics

One objective of this study is to explore the relationships between people’s socio-demographic characteristics (e.g. age, gender, and length of residence) and other personal particulars (e.g. environmental knowledge and environmental activities) and their attachment to place. Therefore, in the final part of the questionnaire, participants were asked to record their background information, such as age, gender, ethnicity, religion, length of residence, highest level of education, flat type, family structure, and home ownership. Items were also included to measure residents’ levels of environmental knowledge and their intensities of environmental activities using a 5-point scale.

Considering that majority of Singaporean can speak English and more than seventy percent of the Singapore’s populations are Chinese, both an English and a Chinese version of the questionnaire were designed and distributed during the survey so that residents can choose the one that they think is easy for them to read and understand. Besides, there is an additional open-ended option at the end of most of the questions, leaving for participants to specify items or issues which they think are relevant to the question of interest but are not included in the questionnaire.

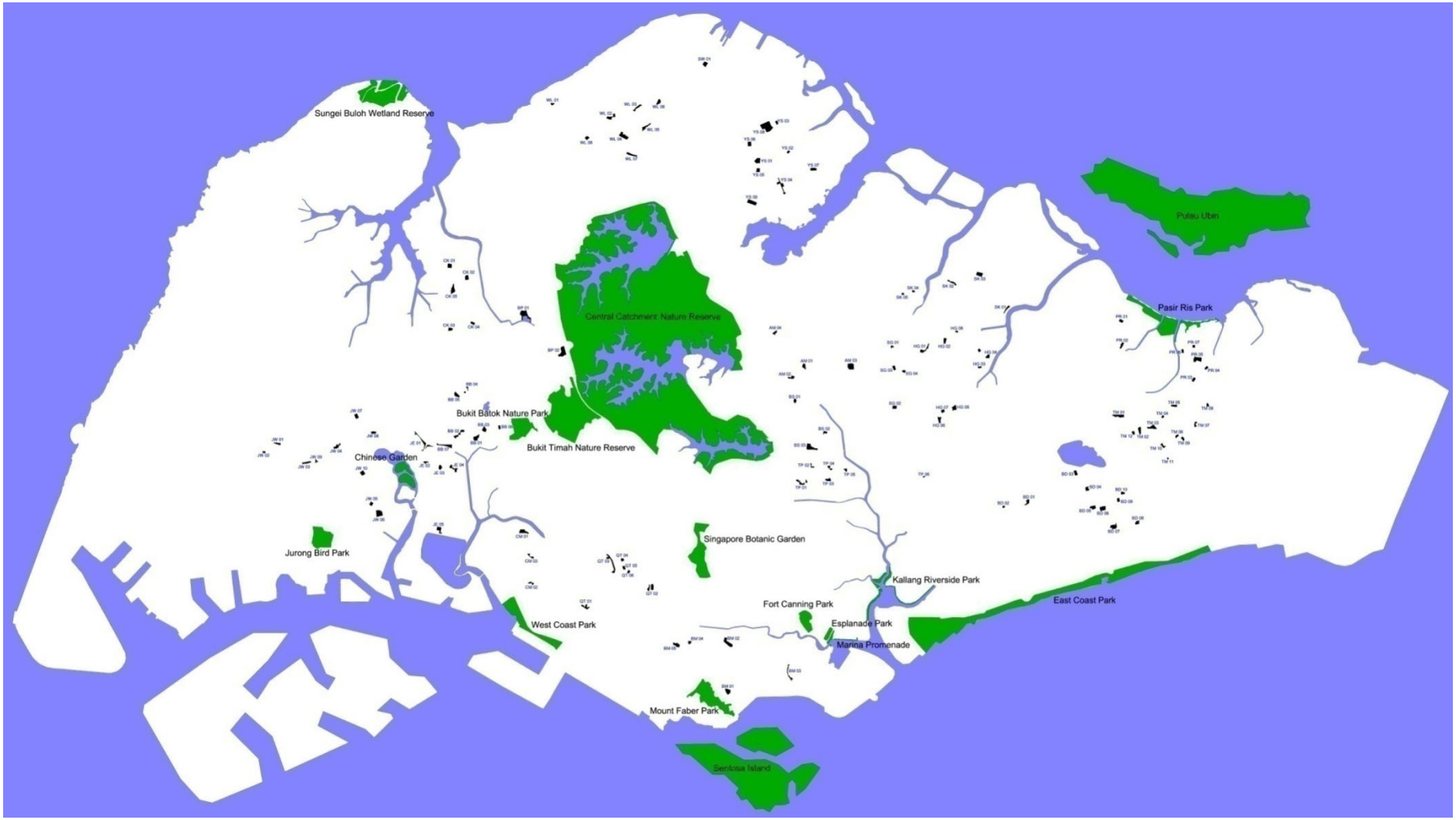


Figure 3. 11 Locations of the urban open spaces listed in questionnaire

3.2.3. Photo-Questionnaire

As argued in Chapter 2, observer-based evaluation technique should be adopted to examine relationship between perceived characteristics of the physical environment and place attachment. Landscape perception studies have demonstrated that preference rating of landscapes is an appropriate and effective tool (Daniel, 1990; Kaplan & Kaplan, 1989; Pitt, Soergell, & Zube, 1979) in environmental evaluation and perception study. The rationale of landscape preference study lies in that, as argued by Kaplan and Kaplan (1989), people respond to what they experience in terms of commonalities, classes, or categories (p. 20). These implicit categories can only be unveiled through indirect approaches like preferences. Abundant research in this area has confirmed that certain consistency does exist in terms of the way people interpret the environment, even though individuals may differ in experiences and backgrounds. High correlations between in situ aesthetic responses to environment and off-site preferential ratings of photographic stimulations were reported in previous studies, indicating that photographs are valid and reliable surrogates to be used in scenic quality evaluation and environmental perception studies (Shuttleworth, 1980). Moreover, researcher has pointed out that preference judgment not only can help in studying perceptual categories and evaluations of environment, but also can be used as a powerful tool to further our understanding of the "intangible" aspects of neighborhood that may foster attachment (Kaplan, 1984, p. 131).

To survey the landscapes of the three chosen neighborhood parks for landscape preference analysis, photos were taken along the main pathways of these parks so that what residents may see when they travel across the park can be captured. Every 20 meters along each pathway four photos were taken at eye level; the first points to the same direction of walking, and each of the rest three photos were taken in 90 degree to the previous direction (Figure 3. 12). The purpose is to capture a semi-panoramic view of the park at each photo-taking position in a relatively systematic manner by recording what a person may see in the four directions at that position during their experiences with the park. All photos are taken with the same camera[22] in similar weather conditions between noon and early afternoon on January and February 2007 so that the lighting conditions of all images are controlled and perspective distortion can be avoided (Kaplan, 1984; Nassauer, 1983).

Figure 3. 12 Example of Photo-taking directions

[22] All photos were taken with a Nikon D50 DSLR and an AF-S DX 18-55mm f/3.5-5.6G ED lens.

Although each park as a whole represents one of the three landscape typologies identified, the landscape scenes captured from within each park are not homogenous. To choose the most representative scenes of each park, all park photos were reviewed and compared by the research team. The criteria for photo selection include: image clarity, diversity of depth of field and viewing angle, diversity of design features (Herzog, Kaplan, & Kaplan, 1976). Other criteria are based on Kaplan and Kaplan's (1989, p. 209) suggestions, such as avoiding visually striking images, avoiding close-up of plants, architectural features, visually prominent people, or other objects, multiple representations for any type of landscape, covering as many landscape typologies as possible, and allowing multiple interpretations.

In terms of quantity of photographs to be included in photo-questionnaire, Kaplan and Kaplan (1989, p. 208) suggests that thirty to sixty to be a feasible and comfortable amount to use. Thus, thirty photos, ten from each park, were finally selected from a large pool of pictures as the most representative scenes that capture the richness of the landscapes of the three neighborhood parks (Figure 3. 13 - Figure 3. 15). These photos are distinct from each other in terms of landscape style represented, spatial organization implied, and design features included (Table 3. 7). To avoid potential influence of color on preference, the thirty chosen photos were then desaturated and transformed into grayscale images to be used in questionnaire (refer to Appendix D).

The thirty selected representative grayscale photographs, ten from each neighborhood park, were grouped in a random manner with photos from each park appear in an alternate sequence. To avoid potential influences of place order and familiarity with one's own neighborhood park on preference rating, three different versions of photo questionnaire were developed to be used in each neighborhood area. For each version of photo questionnaire, the thirty photos were arranged in different sequences so that the first two photographs shown to the respondents of a specific neighborhood are from the neighborhood parks but their own. Each photograph was printed in high resolution (600 dpi) on an A4 paper in landscape orientation, and all the printed images were placed in a separate A4 size display book which was presented to the respondents by the assistants during the survey, one page a time.

Figure 3. 13 Selected Representative Photos of Bukit Panjang Neighborhood 5 Park

3

6

9

12

15

18

21

24

27

30

Figure 3. 14 Selected Representative Photos of Choa Chu Kang neighborhood 7 park

1

4

7

10

13

16

19

22

25

28

Figure 3. 15 Selected Representative Photos of Woodlands neighborhood 6 park


2


5


8


11


14


17


20


23


26


29

Table 3. 7 Landscape Contents Check List

	Photograph Numbers																													
Landscape Contents	3	6	9	12	15	18	21	24	27	30	1	4	7	10	13	16	19	22	25	28	2	5	8	11	14	17	20	23	26	29
Scattered vegetation	●					●	●			●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●
Orderly planted vegetation									●		●		●		●			●	●		●	●	●	●		●	●	●	●	●
Densely planted vegetation	●	●	●	●	●	●	●	●	●	●	●	●							●	●										
Architectural features				●			●		●			●	●	●	●	●	●		●	●	●		●	●		●	●		●	
Straight pathway													●	●	●			●	●		●	●	●	●		●	●	●		
Meandering pathway	●	●	●	●	●				●	●	●						●						●	●	●				●	●
Hard pavement							●		●		●		●		●		●													
Undulating terrain	●	●	●	●	●	●		●		●																				
Naturalistic ground					●	●				●		●			●	●			●	●										
Smooth lawn	●	●	●	●				●	●		●			●		●	●	●	●			●	●	●	●	●	●	●	●	●
Street furniture	●	●		●			●		●		●	●	●		●		●		●	●	●		●	●			●	●	●	●
Recreation facilities	●											●								●			●		●					

Photos from Bukit Panjang neighborhood 5 park

Photos from Choa Chu Kang neighborhood 7 park

Photos from Woodlands neighborhood 6 park

"●" indicates that this landscape feature is contained in the current photograph

3.2.4. The Collection and Processing of Data

To facilitate the on-site operation, the survey area of each of the three neighborhoods under study was further divided into six to eight more or less equal zones, each of whom containing three to five blocks. Eighteen undergraduate student assistants were recruited and trained to carry out the on-site survey from March to May 2007. Each assistant was in charge of either 20 or 30 questionnaires which were required to be distributed in the blocks within one of the several zones of a neighborhood area as assigned by the researcher. They were also provided with a guiding chart describing the exact number of respondent they need to survey according to several key parameters such as age, ethnicity, and gender, in accordance with the demographic profile of HDB residents in general. For example, for those in charge of 30 questionnaires, they should survey roughly equal numbers of male and female residents. Among the 30 residents surveyed, 22 (73.3%) should be Chinese, 5 (16.7%) are Malay, and 3 (10%) are Indians. Regarding the age of the 30 respondents, 3 (10%) should be 15 to 19, 5 (16.7%) be 20 to 29, 6 (20%) be 30 to 39, 7 (23.3%) be 40 to 49, 5 (16.7%) be 50 to 59, and 4 (13.3%) should be 60 or older.

The assistants went from door to door in the designated HDB blocks to find residents that fit the demographic characteristics as described in the given chart. Residents that meet the requirements were approached at their doorstep and asked whether they are willing to spare around half an hour to participate in a survey on residents' relationships with the nearby neighborhood park. Those who agree to participate were presented with the questionnaire and a pack of gift pens as reward. The participants were guided by the student assistants through the whole process of reading and answering the questions. The survey was arranged to be conducted in one week period. Measures were also taken to assure that both weekdays and weekends are appropriately covered.

A total of 400 residents older than fifteen took part in the survey. Thirty-two collected questionnaires containing incomplete and wrongly recorded data were dropped out, resulting in 368 qualified questionnaires for data analysis, 146 from Bukit Panjang neighborhood 5, 103 from Choa Chu Kang neighborhood 7, and 119 from Woodlands neighborhood 6, respectively. Data was then inputted into and analyzed in statistical programs SPSS 14.0 (SPSS.Inc., 2006) and AMOS 6.0 (Arbuckle, 2006).

3.3 Data Analysis

A series of data analysis techniques were adopted in a systematic way to describe the constructs under study and examine the relations between them as proposed in research hypotheses. This section describes the statistical techniques used and their respective purposes.

3.3.1. Preliminary Data Analysis

Data Description

Descriptive statistics, such as frequency distribution, mean, and standard deviation, for each of the constructs under study were reported in the first place so that general trends of participants'

responses to each of the questions can be grasped and compared. One-way analysis of variance (ANOVA) was conducted to examine differences between neighborhoods regarding the mean rating of each question item.

Data Reduction

Principal component factor analyses with varimax rotation were conducted in SPSS 14.0 (SPSS.Inc., 2006) to identify underlying dimensions or meaningful categories of some of the key constructs, such as park landscape preferences, perceived uniqueness of park design elements, park-based recreation activities, park-based social interactions, park satisfaction, park meanings, park upgrading preferences, responses to hypothetical negative changes, and neighborhood attachment.

The criteria employed to distinguish factors include: factor's eigenvalue must be equal to 1.00 or greater, factor loading must be greater than 0.40, i.e. items with 0.4 loading or greater on multiple categories were excluded (Kaplan & Kaplan, 1989, p.214), and a Cronbach's alpha coefficient (Cronbach, 1951) greater than 0.7[23] (Nunnally, 1978) for reliability test of internal consistency of the items comprising a factor extracted. In addition, the acceptance of categories may depend on their interpretability.

New scales were constructed after exploratory factor analysis by averaging each respondent's scores on the items comprising the factor identified, thus condensing the measurement items to a smaller number of key variables (Tan, 2004, p. 463). These new scales were involved in later analysis as representing the dimensions or factors of the constructs under study.

3.3.2. Examining Research Hypotheses

Structural Equation Modeling

Due to the complexity of the construct of place attachment and the relationship between the variables that may influence its development, more and more scholars start to explore the potential of the advanced statistics of structural equation modeling (SEM) to facilitate the examination of the validity and reliability of hypothesized causal relationship between variables pertaining to attachment (refer to section 2.2.7). A great proportion of analyses for hypotheses examination of the current study utilized structural equation modeling technique. Thus, it is necessary to introduce it and explain its advantages in advance.

Structural equation modeling is a multivariate statistical analysis technique which can provide a quantitative test of theoretical models that hypothesize how sets of observed (measured) variables define latent constructs (unobserved variables or factors) and how these constructs are related to each other (Schumacker & Lomax, 2004, p. 2). Compared with other analysis techniques, such as ANOVA, multiple regression, and factor analysis, structural equation modeling approach is a comprehensive and flexible approach and offers certain advantages in that it allows the researchers to: 1) statistically model and test relations among variables depicting complex phenomena; 2) explicitly take measurement error into account; and 3) conduct analysis across multiple groups (Schumacker & Lomax, 2004, p. 7). Also, it can help the

[23] Cortina (1993) recommended an alpha value of 0.60 or above as acceptable for scales with six items or less.

researcher to: 4) simultaneously test a system of theoretical relationships involving multiple dependent variables; 5) restrict the relationships among variables that have been hypothesized *a priori*; 6) and more thoroughly test how well the model fit the data empirically obtained through checking, for example, the goodness-of-fit indexes (Laverie & Arnett, 2000, p. 236).

Since the core construct under study, place attachment, is hypothesized to be a multidimensional concept that consists of three latent dimensions, each of whom being measured by multiple indicators, structural equation modeling is considered a better approach to examine the research hypotheses concerning the factorial structure of place attachment and its relationships with other constructs in that it can include both latent variables and their indicators and other observed variables representing the hypothesized predictor variables.

Examining Hypothesis 1

One concern emerges from literature review is that quite a number of previous studies took for granted the place attachment scale developed based on other researchers' work, such as Williams and his colleagues' work, and failed to examine the validity and reliability of the dimensional structure of place attachment in new research contexts before bringing them into further analysis, especially when new dimension was proposed. In addition, some have concerned that many studies tended to treat their samples as homogenous unit and failed to cross-validate the factorial structure of the proposed measurement instrument across subsamples of the population or particular groups before conducting further substantive analysis, such as tests of group mean differences, invariance of structural parameter estimates (Kyle, et al., 2005).

Regarding the two issues mentioned above, structural equation modeling was conducted using AMOS 6.0 (Arbuckle, 2006) to examine Hypothesis 1 for two purposes: 1) to confirm the factorial structure of place attachment as hypothesized and 2) to examine the measurement invariance of the thus derived factorial model of place attachment across subgroups within the sample. Firstly, according to the research framework of this study, place attachment is a multidimensional construct that consists of three dimensions: place dependence, place identity, and place caring. Thus, confirmatory factor analysis was conducted to examine the validity and reliability of this hypothesized three-factor structure of place attachment. Specifically, to examine the suitability of the hypothesized factorial structure of park attachment, park dependence, park identity, and park caring were treated as latent variables and their respective measurement items were treated as indicator variables. For the purpose of rigorousness, alternative models providing potentially feasible explanations of the dimensional structures of place attachment were also proposed and examined. The superiority of the hypothesized factorial models of place attachment was then examined by comparing the goodness-of-fit indexes of all these models. Secondly, to determine whether or not the measurement properties of the most superior model is equivalent across subgroups of the entire sample, invariance test via structural equation modeling was conducted by splitting the entire sample into two equal groups and examining whether 1) the factor loadings, 2) the factor variances and covariances, 3) and the residual variances and covariances of the chosen model are equivalent across the two groups (Byrne, 2001; Hoyle & Smith, 1994). The purpose is to address the question: Whether the chosen measurement model of place

attachment is interpreted by respondents from the subgroups in a conceptually similar manner? (Vandenberg & Lance, 2000)

Once the factorial validity of the dimensional structure of park attachment is confirmed and the measurement invariance of the model is established, the whole measurement model including both the latent variables representing the dimensions of place attachment and their measurement items, rather than a single composite indicator, was involved in the examination of Hypothesis Two which concerns the structural relationships between the hypothesized predictor variables and each of the attachment dimensions.

Examining Hypothesis 2

- Hypothesis 2a

To examine Hypothesis 2a, which concerns the direct effects of the hypothesized predictor variables within each domain on place attachment, path diagrams were constructed in AMOS 6.0, in which the dimensions of place attachment in the measurement model as derived from the examination of the first hypothesis were treated as dependent variables and the observed variables or the scales representing the predictors were treated as independent variables. Structural equation modeling was used to examine 1) the fit of the path model to the data and 2) the magnitud and significance of the direct effects of the predictor variables on each dimension of place attachment. The purposes are: 1) to find out what the independent contributions of each predictive domain to place attachment are and 2) to identify the significant predictors of place attachment within each of the predictive domains.

- Hypothesis 2b

To examine Hypothesis 2b, which concerns the prominence of place meaning in terms of contribution to place attachment, similar path diagram was constructed in AMOS 6.0, with however, only the significant predictors of place attachment from each predictive domain as identified in the preceding analysis included as independent variables. Similarly, structural equation modeling was used to examine 1) the fit of the path model to the data and 2) the magnitude and significance of the direct effects of each predictor variable on each dimension of place attachment. The purpose is to examine the relative contributions of the significant predictors in the prediction of place attachment when included with the others.

- Hypothesis 2c

To examine Hypothesis 2c, which concerns the mechanism of the development of place attachment, and specifically, the mediating effect of place meaning in the prediction of place attachment, mediation analysis was used to examine whether and to what extent the effects of hypothesized predictor variables, such as place experience, place perception, and place satisfaction, on place attachment are mediated via their contributions to identification with place meanings.

The concept of mediation analysis is illustrated in Figure 3. 16. According to Baron and Kenny (1986, p. 1176), a mediator is one which accounts for all or part of the relation between a predictor variable and a criterion or an outcome variable, as depicted in Figure 3. 16b. The

four-step procedure of mediation analysis as recommended in literature (Frazier, Tix, & Barron, 2004; Kenny, Kashy, & Bolger, 1988) was adopted in this study to examine whether place meaning mediates the relation between predictor variables and place attachment: the first step is to show that the predictor variable is significantly associated with the outcome variable, which in this case is place attachment (see Path c in Figure 3. 16a); the second step is to show that the predictor variable is significantly related to the mediator variable, which is the level of identification with place meanings in this case (see Path a in Figure 3. 16a); the third step is to show that the mediator variable (place meaning) affects the outcome variable (place attachment), controlling for the effect of the predictor variable on the outcome variable (see Path b in Figure 3. 16b); the final step is to show that the effect of the predictor variable on the outcome variable controlling for the effect of the mediator variable (see Path c' in Figure 3. 16b) decreases significantly compared with that in the first step (compare Path c in Figure 3. 16a and Path c' in Figure 3. 16b). If all four steps described above are met, the data can be regarded as consistent with the hypothesis that place meaning mediate the relations between predictor variables and place attachment. Complete mediation is the case in which the effect of the predictor variable on the outcome variable controlling for the effect of the mediator variable on the outcome variable as indicated by Path c' in Figure 3. 16b is not significantly different from zero. Partial mediation is the case in which Path c' decreased in absolute value compared with Path c but is still statistically significant. The amount of mediated effect is indicated by the reduction of the effect of the predictor variable on the outcome variable (place attachment) or *c-c'*, which equals the product of the effect of the predictor variable on the mediator variable (place meaning) and the effect of the mediator variable (place meaning) on the outcome variable (place attachment) or *a*b*. The significance of the mediated effect is evaluated via its zero score[24], with a value greater than 1.96 indicating the mediated effect is significant at the 0.05 level.

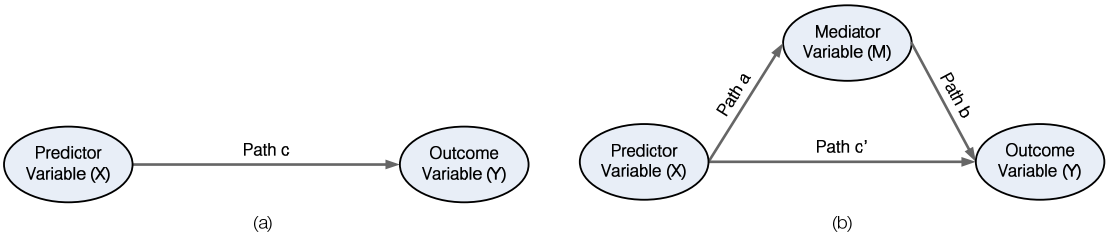


Figure 3. 16 Mediation analysis

Structural equation modeling using AMOS 6.0 was utilized for mediation analysis in current study because, as suggested by Baron and Kenny (1986), it is the most efficient and least problematic method of testing mediation. Since structural equation modeling can simultaneously estimate multiple equations and include latent variables, this technique 1) avoids problems of over- and underestimation of mediating effects by taking measurement error into account, 2) allows a much rigorous examination of the mediated effect by including multiple predictor variables, multiple outcome variables, and multiple mediator variables, thus minimizing the potential problems caused by omitted variables, 3) and provides information on the degree of fit of the entire model to the data (Baron & Kenny, 1986; Frazier, et al., 2004; Hoyle & Smith, 1994).

[24] As recommended by Frazier et al. (2004, p. 128), the zero score of the mediated effect is calculate by dividing the product of Path *a* and Path *b* by a standard error term, which is the square root of $b^2sa^2+a^2sb^2+sa^2sb^2$, where *a* and *b* are unstandardized regression coefficients and *sa* and *sb* are their respective standard errors.

First, mediation analyses were conducted for the exogenous structural factors, such as the socio-economic characteristics of people and the physical characteristics of place (Figure 3. 17). According to the procedures of mediation analysis as explained above, the first step was to construct a path diagram to examine the direct effects of structural factors on place attachment (as indicated by path c in Figure 3. 17a). Once the fit of the direct effect model to the data was established, estimation of the mediation model (Figure 3. 17b) tested whether the mediator, level of identification with park meanings, accounts for the relation between the predictor variables and place attachment. In other words, the last three steps of mediation analysis as explained previously were combined and tested simultaneously in the mediation model. If the indirect effect of the predictors through the mediator is significant, which will result in a decline in the direct effect (as indicated by path c' in Figure 3. 17b) in the mediational model, then a pattern consistent with the mediational hypothesis has be obtained (Hoyle & Smith, 1994).

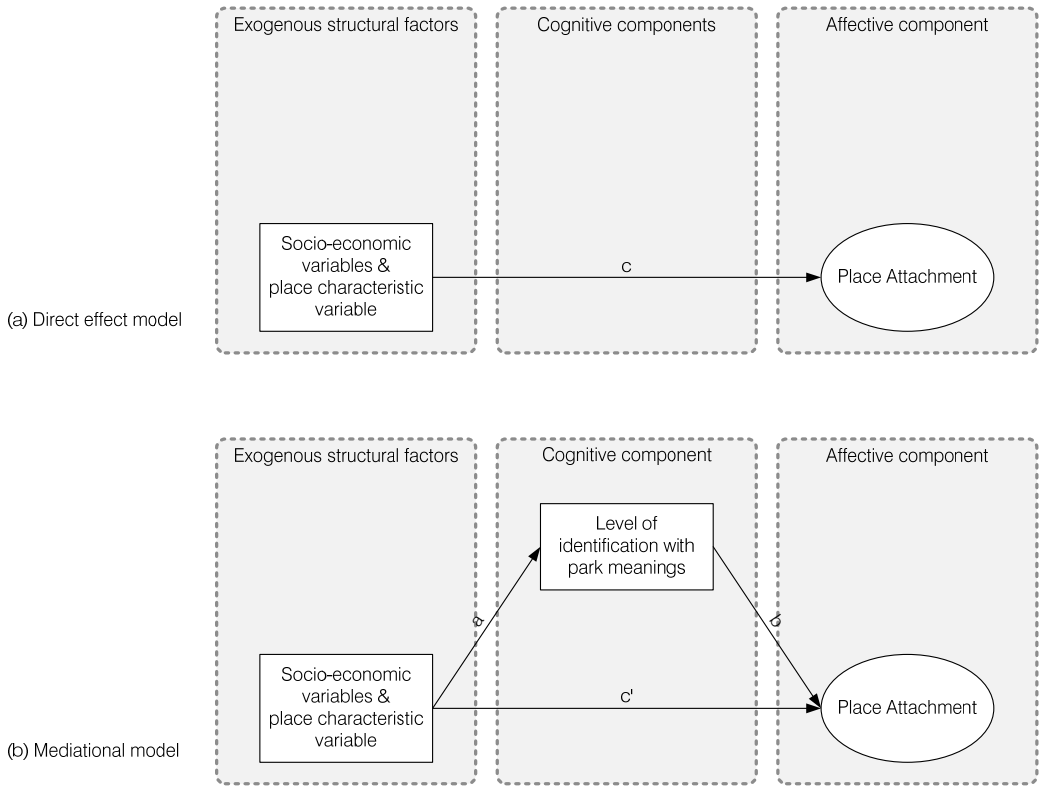


Figure 3. 17 Mediation analysis for structural factors

Second, mediation analyses were conducted for each group of variables belonging to different cognitive domains, such as place experience, place perception, and place satisfaction (Figure 3. 18). As with the previous analysis, path diagrams were constructed individually for each domain to examine the direct effects of each group of variables on place attachment (Figure 3. 18a). According to the research framework, socio-economic variables and variables related to the physical characteristics of place are fundamental structural factors affecting both the cognitive and affective components of place attachment. Thus, they were included in the direct effect model as exogenous variables so that the direct effect of place experience, perception, or satisfaction variables on place attachment net of the effects of these structural factors (as

indicated by path c in Figure 3. 18a) can be estimated. This inclusion of the exogenous variables in the mediational model is also a procedure implemented in response to the general concern raised in mediation analysis literature that in order to avoid biased estimates due to omitted variables that may cause both the outcome and the mediator variable, these variables should be included so that their effects can be controlled in mediation analysis (Frazier, et al., 2004, p. 129; Judd & Kenny, 1981, p. 607; Kenny, et al., 1988, p. 262).

Given that the direct effect model is consistent with the data, estimation of the mediational model (Figure 3. 18b) tested whether the mediator, i.e. level of identification with park meanings, accounts for the relation between each group of predictor variables and place attachment. Exogenous variables were retained in the mediational model, thus providing a more stringent examination of the relationships between predictor variables, mediator, and place attachment over and above the effects of the structural factors (as indicated by path a, b, and c' in Figure 3. 18b). Insignificant or decreased direct effect of the predictor variables on place attachment in the mediational model (as indicated by path c' in Figure 3. 18b) will provide evidence for complete or partial mediating effect of identification with park meanings in the prediction of place attachment.

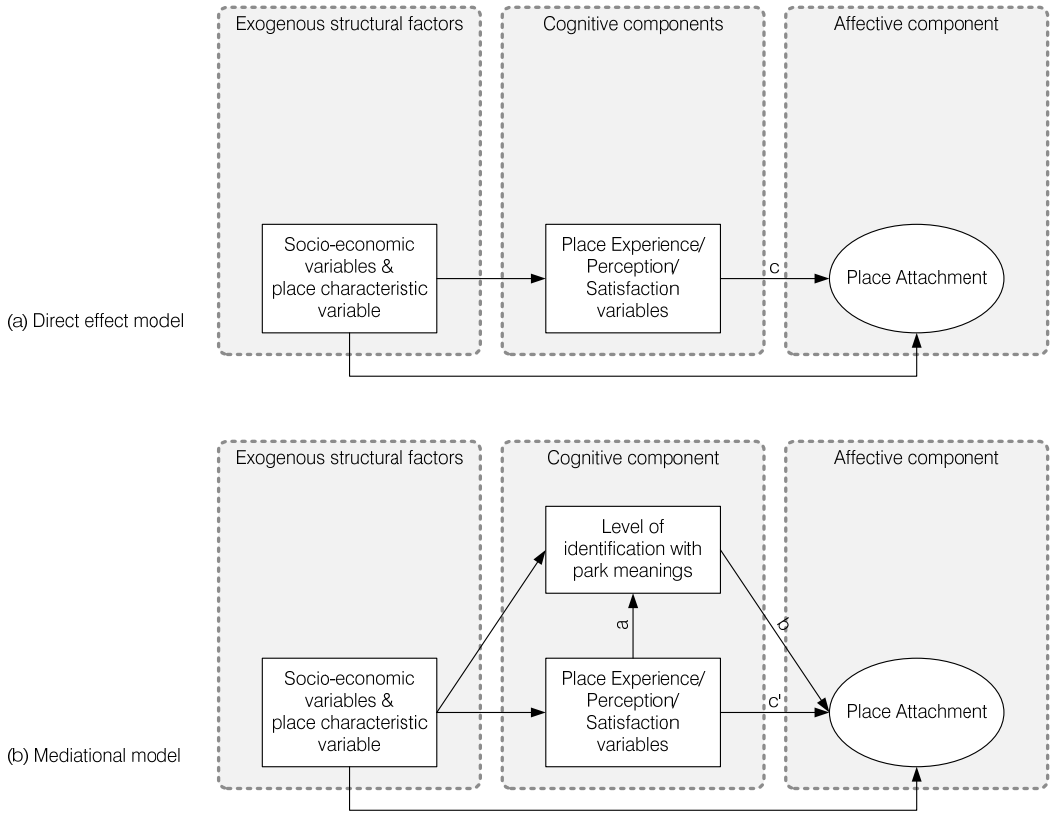


Figure 3. 18 Mediation analysis for variables belonging to the cognitive domain

Examining Hypothesis 3

To examine hypothesis 3a and 3b, which concerns the impacts of place attachment on place-related attitudes and behaviors and neighborhood attachment, respondent were divided into groups according to their level of park attachment via cluster analysis. One-way analysis of variance was then conducted to explore whether there are significant differences between the

park attachment groups regarding their mean ratings on the park-related attitude and behavior scales and the neighborhood attachment scale. Significant group differences thus identified will provide evidence to support the notion that positive emotional tie with a place is not an end in itself but may affect attitudes and behaviors related to the place.

CHAPTER 4. PRELIMINARY ANALYSES AND SCALE CONSTRUCTION

This chapter reports the results of preliminary analyses related to the constructs under study. First, the profile of participants was described. Second, results related to the constructs explored in each of the nine parts of the questionnaire are reported in separate sections. Within each section, descriptive statistics were reported at the first place, followed by the results of exploratory factor analyses and analysis of group differences regarding the summative scales derived from factor analyses.

4.1. Profile of Participants

A total of 400 HDB residents from the three neighborhood areas under study participated in the survey. Thirty two questionnaires containing wrongly recorded and incomplete data were excluded from analysis, resulting in 368 usable survey data. The socio-demographic profiles of the qualified participants are described below.

In terms of the key demographic indexes - age, gender, and ethnicity - the socio-demographic profiles of survey participants are quite close to that of the HDB residents (Table 4. 1), except that young residents aged 15 to 19 were slightly over-sampled and senior residents older than 50 and residents who are neither Chinese, Malay nor Indian were slightly under-sampled. The quantity of samples of each neighborhood also reaches the required minimum number of 100, with 146 participants from Bukit Panjang neighborhood 5, 103 participants from Choa Chu Kang neighborhood 7, and 119 participants from Woodlands neighborhood 6. Considering the exploratory nature of this study, the survey sample is regarded as acceptable and representative of the HDB residents in general.

Table 4. 1 Demographic Profile of Respondents

		Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)		HDB Residents in General (age>=15)*
Gender	Male	71	48.6%	45	43.7%	61	51.3%	177	48.1%	49.6%
	Female	75	51.4%	58	56.3%	58	48.7%	191	51.9%	50.4%
Ethnicity	Chinese	104	71.2%	73	70.9%	74	62.2%	251	68.2%	74.5%
	Malay	27	18.5%	18	17.5%	24	20.2%	69	18.8%	16.5%
	Indian	11	7.5%	8	7.8%	16	13.4%	35	9.5%	8.0%
	Others	4	2.7%	4	3.9%	5	4.2%	13	3.5%	11.0%
Age	15-19	24	16.4%	15	14.6%	23	19.3%	62	16.8%	9.4%
	20-29	28	19.2%	23	22.3%	15	12.6%	66	17.9%	16.4%
	30-39	30	20.5%	29	28.2%	26	21.8%	85	23.1%	21.8%
	40-49	42	28.8%	21	20.4%	40	33.6%	103	28.0%	23.0%
	50-59	14	9.6%	9	8.7%	13	10.9%	36	9.8%	14.9%
	>=60	8	5.5%	6	5.8%	2	1.7%	16	4.3%	14.5%

*Based on Fong (2005).

With regard to religious belief, 32.88% of participants are Buddhist, followed by Muslim (20.22%), Christian (12.77%), Non-religious (11.41%), Taoist (8.97%), Catholic (7.88%), and Hindu (5.98%). Nearly half (40.75%) of participants either have professional certificates (5.43%)

or polytechnic diplomas (17.93%), or have graduate degrees and above (17.39%). More than half (57.61%) of participants have lived in their current HDB flat for six years or longer. The majority (93.47%) of participants live in flats with 4 rooms or more. Nearly half (48.1%) of participants' families have children in schooling age. And the majority (92.12%) of respondents own their current flat (Table 4. 2).

Table 4. 2 Socio-economic Profile of Respondents

		Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
Religion	Buddhist	50	34.25%	28	27.18%	43	36.13%	121	32.88%
	Taoist	15	10.27%	11	10.68%	7	5.88%	33	8.97%
	Muslim	30	20.55%	19	18.45%	25	21.01%	74	20.11%
	Christian	21	14.38%	15	14.56%	11	9.24%	47	12.77%
	Catholic	5	3.42%	13	12.62%	11	9.24%	29	7.88%
	Hindu	8	5.48%	2	1.94%	12	10.08%	22	5.98%
	Others	17	11.64%	15	14.56%	10	8.40%	42	11.41%
Highest level of education	PSLE and below	26	17.81%	13	12.62%	21	17.65%	60	16.30%
	O/N level	43	29.45%	31	30.10%	48	40.34%	122	33.15%
	A level	14	9.59%	10	9.71%	12	10.08%	36	9.78%
	ITE certificate	6	4.11%	11	10.68%	3	2.52%	20	5.43%
	Poly diploma	28	19.18%	17	16.50%	21	17.65%	66	17.93%
	Graduate degree and above	29	19.86%	21	20.39%	14	11.76%	64	17.39%
Length of residence in current HDB flat	Less than one year	5	3.42%	6	5.83%	2	1.68%	13	3.53%
	1-3 years	27	18.49%	11	10.68%	16	13.45%	54	14.67%
	3-6 years	31	21.23%	17	16.50%	41	34.45%	89	24.18%
	6-9 years	40	27.40%	27	26.21%	21	17.65%	88	23.91%
	9 years or longer	43	29.45%	42	40.78%	39	32.77%	124	33.70%
Flat type	1-2 rooms flat	2	1.37%	1	0.97%	0	0.00%	3	0.82%
	3-room flat	14	9.59%	4	3.88%	3	2.52%	21	5.71%
	4-room flat	71	48.63%	44	42.72%	52	43.70%	167	45.38%
	5-room flat	36	24.66%	36	34.95%	22	18.49%	94	25.54%
	HDB Executive Suit	23	15.75%	18	17.48%	42	35.29%	83	22.55%
Type of family	Young couple with no children yet	6	4.11%	4	3.88%	2	1.68%	12	3.26%
	With children aged 6 and below	21	14.38%	14	13.59%	18	15.13%	53	14.40%
	With schooling children	55	37.67%	52	50.49%	70	58.82%	177	48.10%
	With working children	18	12.33%	11	10.68%	13	10.92%	42	11.41%
	Three-generation family	22	15.07%	16	15.53%	11	9.24%	49	13.32%
	Elderly couple living on own	2	1.37%	1	0.97%	0	0.00%	3	0.82%
	Others	22	15.07%	5	4.85%	5	4.20%	32	8.70%
Flat ownership	Own	134	91.78%	92	89.32%	113	94.96%	339	92.12%
	Rent	12	8.22%	11	10.68%	6	5.04%	29	7.88%

On average, participants' environmental knowledge (Table 4. 3) can only be regarded as at medium level across the three neighborhoods, with awareness of global ecological problems (M=2.56) ranking the highest, followed by other more specific knowledge about natural environment. Participants' average environmental activities (Table 4. 4) were also at medium level across the three sites, with non-social activities, such as TV watching (M=3.2), reading (M=2.66),

and internet surfing (M=2.37), ranking higher and social activities, such as joining nature observation (M=2.14) and volunteer in community gardening (M=1.69), ranking lower. Two composite scales were constructed, namely environmental knowledge and environmental activities, for each participant by computing the mean rating across items within corresponding question. Bivariate correlation analysis found that participants' levels of environmental knowledge were significantly associated with their frequencies of environmental activities (r=0.511, p=0.01, for all 368 participants; r=0.519, p=0.01, for Bukit Panjang participants; r=0.572, p=0.01, for Choa Chu Kang participants; and r=0.466, p=0.01, for Woodlands participants), indicating that the more environmental knowledge a participant has, the more environmental activities he or she will conducts.

Table 4. 3 Level of environmental knowledge

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
I'm aware of the global ecological problems nowadays	2.84	1.15	2.83	0.96	3.18	1.04	2.95	1.08
I can tell the names of many animals I see in nature	2.72	1.02	2.68	0.95	2.81	0.95	2.74	0.97
I can tell where some of the wildlife live in nature	2.51	0.98	2.50	0.93	2.54	1.00	2.52	0.97
I know the natural history of Singapore	2.17	0.99	2.51	0.92	2.48	1.11	2.37	1.02
I can identify many different plant species in nature	2.16	0.82	2.20	0.93	2.28	0.94	2.21	0.89
Grand Mean	2.48		2.54		2.66		2.56	
Cronbach's alpha	0.79		0.84		0.78		0.80	

Sorted by mean ratings of "Total". Scale: 1=Not at all, 2=Slightly, 3=Moderately, 4=Very much, 5=Extremely

Table 4. 4 Frequency of environment-related activities

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Watch TV programs about the natural world	3.03	0.94	3.31	0.83	3.31	0.92	3.20	0.91
Read about books on nature	2.49	0.98	2.83	0.94	2.73	1.09	2.66	1.02
Search the internet for information about nature	2.26	1.05	2.59	1.07	2.32	1.10	2.37	1.08
Join friends in nature observation activities	2.08	0.93	2.31	0.90	2.07	1.05	2.14	0.96
Volunteer in community gardening activities	1.72	0.90	1.82	0.89	1.55	0.82	1.69	0.88
Grand Mean	2.32		2.57		2.39		2.41	
Cronbach's alpha	0.80		0.82		0.79		0.80	

Sorted by mean ratings of "Total". Scale: 1=Never, 2=Seldom, 3=Sometimes, 4=Quite often, 5=Very Frequently

4.2. Importance of Neighborhood Park in the HDB Residents' Life

What is the role that neighborhood park plays in HDB residents' everyday life? This section describes the results related to questions concerning the relative importance of neighborhood park in residents' everyday life.

Neighborhood Orientation

With regard to design elements that are helpful for residents to recognize their own

neighborhood (Table 4. 5), nearby neighborhood park ranked the third (M=3.39). MRT/LRT[25] station or bus stop (M=3.74) and the shopping mall at town centre (M=3.72) were considered by participants as the most helpful planning elements. Block number sign (M=3.37), landscaped sign of neighborhood entrance (M=3.02) were also thought to be helpful in neighborhood orientation, though to a lesser extent. Children's playground downstairs (M=2.96), community centre (M=2.86), and architectural design of the blocks (M=2.85) seemed to provide even less help in recognize one's own neighborhood.

Table 4. 5 Design Elements that are Helpful in Recognizing One's Own Neighborhood

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
MRT/LRT station or bus stop	3.73	1.03	3.64	1.14	3.82	1.01	3.74	1.06
Shopping mall at town centre	3.90	1.04	3.56	1.14	3.64	1.13	3.72	1.11
Neighborhood park	3.24	1.16	3.33	1.11	3.62	1.17	3.39	1.16
Block number sign	3.33	1.36	3.27	1.23	3.51	1.29	3.37	1.30
Landscaped sign of neighborhood entrance	2.82	1.23	3.14	1.16	3.18	1.19	3.02	1.21
Children's playground downstairs	2.71	1.23	3.05	1.26	3.20	1.22	2.96	1.25
Community centre	2.77	1.27	3.07	1.35	2.80	1.27	2.86	1.30
Architectural design of the blocks	2.63	1.19	3.04	1.23	2.97	1.22	2.85	1.22

Sorted by mean ratings of "Total". Scale: 1=Not helpful at all, 2=A bit helpful, 3=Helpful, 4=Quite helpful, 5=Very helpful

Places for Socialization

As to the places within neighborhood area where residents usually meet their neighbors or friends (Table 4. 6), neighborhood park nearby one's home (M=2.77) does not stand out prominently. Shopping mall at town centre (M=3.31), MRT station (M=3.24), void deck downstairs (M=3.09), and corridors outside the flat (M=3.01) are places that are relatively more frequently used by participants to socialize with others, followed by hawker centre (M=2.77), precinct playground downstairs (M=2.58), covered walkway to the bus stop (M=2.53), and community centre (M=1.98).

Table 4. 6 Place to Meet Neighbors or Friends within Neighborhood

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Shopping mall at town centre	3.45	1.06	3.28	1.12	3.15	1.09	3.31	1.09
MRT station	3.02	1.17	3.50	1.14	3.29	1.14	3.24	1.17
Void deck downstairs	3.22	1.28	3.17	1.27	2.86	1.21	3.09	1.26
Corridor outside my flat	3.11	1.39	3.17	1.44	2.74	1.35	3.01	1.40
Neighborhood park near my home	2.60	1.24	2.94	1.20	2.83	1.30	2.77	1.25
Hawker centre	2.84	1.10	2.98	1.10	2.50	1.06	2.77	1.10
Precinct playground downstairs	2.64	1.34	2.62	1.13	2.49	1.24	2.58	1.25
Covered walkway to the bus stop	2.73	1.23	2.66	1.14	2.18	1.16	2.53	1.21
Community centre	1.95	1.03	2.10	1.04	1.91	0.96	1.98	1.01

Sorted by mean ratings of "Total". Scale: 1=Never, 2=Seldom, 3=Sometimes, 4=Quite often, 5=Very frequently

[25] MRT (Mass Rapid Transit) is the urban railway public transportation system in Singapore. LRT (Light Rail Transit) is the above ground railway public transportation system that provide intra-town loop and/or shuttle services in several HDB new towns.

House-buying Priority

In order to find out the extent to which residents regard nearby open space as one of the key factors in facilitating their house-buying decision-making, participants were asked the reasons to choose to live in their current neighborhood (Table 4. 7). The results indicated that participants generally agreed that all the eight items included in the questionnaire are part of the reasons to settle down in their present flat, though in different degrees. Obviously, participants regarded "convenient transportation" (M=3.95) and "nearby school for children" (M=3.72) as the most important factors for housing choosing. "Cost of living" (M=3.55) and "layout of the flat" (M=3.48) were also important factors. Though with relatively lower ratings, "safety of public spaces" (M=3.44) and "parks and other landscaped open spaces" (M=3.42) were still regarded as important issues to be considered. Participants agreed to a lesser extent that "recreation facilities" and "architectural design of the buildings" are the reason for them to choose the current neighborhood.

Table 4. 7 Reasons to Choose to Live in Current HDB Flat

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Transportation	3.70	1.07	4.12	0.90	4.11	0.97	3.95	1.01
Nearby school for children	3.58	1.14	3.83	1.06	3.81	0.99	3.72	1.07
Cost of living	3.61	0.88	3.55	0.92	3.48	0.98	3.55	0.92
Layout of the flat	3.45	1.00	3.45	1.00	3.55	0.85	3.48	0.95
Safety of public spaces	3.29	0.98	3.51	0.94	3.57	0.85	3.44	0.93
Parks and other landscaped open spaces	3.40	1.01	3.45	0.97	3.42	0.96	3.42	0.98
Recreation facilities	3.05	0.98	3.33	0.97	3.21	0.91	3.18	0.96
Architectural design of the buildings	3.06	0.96	3.15	0.94	3.00	0.98	3.07	0.96

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Places for Recreation

To find out how residents use neighborhood park and other types of public spaces for recreaiton, participants were asked their frequencies of visiting a wide range of open spaces within the city. The results (Table 4.8) indicated that, across the three neighborhoods, nearby neighborhood park (M=3.15), void deck area (M=3.28), and precinct playground downstairs (M=2.72) were the most frequently visited spaces in comparison with the other types of open spaces in HDB new towns and the other urban public spaces.

Table 4. 8 Frequency of Visiting Urban Open Spaces

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Void deck area downstairs	3.32	1.47	3.19	1.54	3.30	1.42	3.28	1.47
Nearby neighborhood park	2.99	1.32	3.21	1.30	3.29	1.40	3.15	1.35
Precinct playground downstairs	2.49	1.40	2.66	1.45	3.05	1.49	2.72	1.46
East Coast Park	2.09	1.12	1.98	1.17	2.19	1.14	2.09	1.14
Sentosa Island	1.90	1.10	1.94	1.11	2.03	1.12	1.95	1.11
Esplanade Park	1.59	0.96	1.95	1.13	1.51	0.96	1.67	1.02
West Coast Park	1.48	0.82	1.76	1.04	1.41	0.87	1.54	0.91
Pasir Ris Park	1.36	0.70	1.68	0.97	1.61	0.90	1.53	0.86
Botanic Garden	1.46	0.83	1.60	0.88	1.45	0.82	1.50	0.84
Jurong Bird Park	1.34	0.71	1.62	0.86	1.58	0.90	1.49	0.83
Bukit Timah Nature Reserve	1.55	0.88	1.48	0.81	1.27	0.65	1.44	0.80
Bukit Batok Nature Park	1.47	0.94	1.42	0.75	1.24	0.68	1.38	0.81
Marina Promenade	1.24	0.60	1.50	0.93	1.20	0.50	1.30	0.69
Sungei Buloh Wetland Reserve	1.27	0.58	1.39	0.70	1.25	0.60	1.30	0.62
Fort Canning Park	1.21	0.53	1.41	0.72	1.29	0.71	1.29	0.65
Chinese Garden	1.25	0.62	1.35	0.68	1.26	0.50	1.28	0.60
Mount Faber Park	1.23	0.57	1.41	0.76	1.23	0.51	1.28	0.62
Central Catchment Nature Reserve	1.23	0.58	1.38	0.78	1.18	0.52	1.26	0.63
Pulau Ubin	1.18	0.55	1.29	0.62	1.21	0.57	1.22	0.58
Kallang Riverside Park	1.13	0.43	1.35	0.74	1.14	0.37	1.20	0.53

Sorted by mean ratings of “Total”.

Scale: 1=Seldom (once a year or less), 2=Occasionally (every other month or less), 3=Sometimes (once a month or more), 4=Quite often (once a week or more), 5=Frequently (almost every day)

Results of exploratory factor analysis (Table 4. 9) further confirmed that participants’ pattern of using nearby open spaces is significantly different from that of using other types of urban open spaces. Nearby neighborhood park, void deck area, and precinct playground downstairs all loaded on to a single factor which had acceptable internal item consistency (alpha=0.7) and the highest group mean rating (M=3.05). This is consistent with the results reported in previous research such as Yuen (1996b) and Yuen and Wong (2005) which suggest that nearby open spaces may feature a far more important role in HDB residents’ life than the other types of recreational settings in the hierarchy of urban open spaces.

Table 4. 9 Exploratory Factor Analysis: Frequency of Visiting Urban Open Spaces

Open Space	Factor 1	Factor 2	Factor 3	Factor 4	Item mean	SD
Central Catchment Nature Reserve	**0.71**	0.11	0.01	0.11	1.26	0.63
Sungei Buloh Wetland Reserve	**0.67**	0.11	0.35	0.07	1.30	0.62
Kallang Riverside Park	**0.66**	0.00	0.28	0.08	1.20	0.53
Bukit Timah Nature Reserve	**0.62**	0.05	0.16	0.03	1.44	0.80
Bukit Batok Nature Park	**0.60**	0.29	-0.03	0.08	1.38	0.81
Mount Faber Park	**0.59**	0.18	**0.41**	-0.04	1.28	0.62
Marina Promenade	**0.51**	0.31	-0.01	0.26	1.30	0.69
Pulau Ubin	**0.50**	**0.40**	0.12	-0.14	1.22	0.58
Chinese Garden	**0.49**	0.32	0.16	0.03	1.28	0.60
Sentosa Island	0.07	**0.80**	0.16	-0.04	1.95	1.11
East Coast Park	0.07	**0.69**	0.35	0.19	2.09	1.14
Esplanade Park	0.34	**0.61**	-0.02	0.13	1.67	1.02
West Coast Park	0.35	**0.51**	0.27	0.16	1.54	0.91
Jurong Bird Park	0.32	**0.42**	**0.40**	0.11	1.49	0.83
Pasir Ris Park	0.02	0.27	**0.72**	0.18	1.53	0.86
Botanic Garden	**0.40**	0.09	**0.67**	-0.03	1.50	0.84
Fort Canning Park	**0.44**	0.24	**0.50**	0.05	1.29	0.65
Precinct playground downstairs	0.12	0.00	0.13	**0.81**	2.72	1.46
Void deck area downstairs	0.07	0.19	-0.12	**0.75**	3.28	1.47
Nearby neighborhood park	0.03	0.04	0.18	**0.74**	3.15	1.35
Eigenvalue	6.40	1.83	1.38	1.05		
% of Variance explained	19.78	13.05	10.43	10.05		
Cumulative variance explained	19.78	32.83	43.27	53.32		
Cronbach's alpha	0.83	0.76	*	0.70		
Factor mean	1.31	1.81	*	3.05		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

N=368. Scale: 1=Seldom (once a year or less), 2=Occasionally (every other month or less), 3=Sometimes (once a month or more), 4=Quite often (once a week or more), 5=Frequently (almost every day)

*Value was not calculated due to lack of qualified items within this factor

(Please refer to section 3.3.1 for the criteria of factor analysis).

4.3. Perception toward Neighborhood Park Landscape (Place Perception)

This section describes the results of the analysis on how residents perceive the physical environment of neighborhood parks.

Bukit Panjang neighborhood 5 park, Choa Chu Kang neighborhood 7 park, and Woodlands neighborhood 6 park are chosen as the study sites, and they are representatives of the three landscape typologies of neighborhood parks in the HDB new towns, namely naturalistic landscape, geometric landscape, and mixed landscape, respectively, and first three of the six spatial typologies of neighborhood parks, namely “one-side-open”, “cornered”, and “centered”, respectively.

How might the residents appreciate the landscape design of these parks? Participants were asked to rate the thirty representative landscape photographs of the three neighborhood parks, ten for each park, according to how much they like the scene using a 7-point scale (“1=Don't like

it at all" to "7=Like it very much"), without being informed where each photo was taken from.

4.3.1. Landscape Preferences

Descriptive Statistics

Neighborhood park landscape preferences were first analyzed by ranking the photographs according to their mean ratings (Table 4. 10). The photographs sorted by mean ratings are shown in Figure 4. 1 to Figure 4. 3.

To participants as a whole, the ten most preferred landscapes are characterized by a richness of landscape features contained within the images (Table 4. 11). Each of the ten most preferred photographs contains an average of six design features, whereas each of the rest twenty photographs covers only five design features on average.

The ten most preferred photographs included pictures from all the three neighborhood parks. The landscapes shown in these pictures were dominated by artificial design elements. All ten photographs contained street furniture such as lamp posts, dustbins, and roadside seats. Except photo 23, all the other nine photographs showed clearly the existences of architectural features such as pavilion, tent, bridge, and covered walkway. The ten images were also characterized by deep depth of field. Most of the ten photographs had clear views and orientation in terms of visual access of the destination of the pathways within the images.

The landscapes of the ten least preferred photographs were characterized either by densely planted vegetation with no sign of clear orientation, or by ground covered by simple texture such as smooth lawn, vacant plot, and hard pavement. Although architectural features can be identified in five of the photograph, they were either located far away from the position of the camera or hiding behind dense vegetations, thus making it hard for viewers to realize their existence. Lacking in street furniture (shown in only three images) and recreation facilities (shown in only one image) make this group of photographs appear much less lively and interesting than those in the most preferred group.

Table 4. 10 Mean Ratings of Neighborhood Park Photos

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)	
	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD
Photo_02 (WL)	5.11	1.31	1	4.88	1.17	1	5.30	1.27	1	5.11	1.27
Photo_13 (CK)	4.76	1.39	3	4.65	1.36	4	5.02	1.30	2	4.81	1.36
Photo_27 (BP)	4.75	1.46	4	4.76	1.22	3	4.83	1.21	7	4.78	1.31
Photo_04 (CK)	4.77	1.71	2	4.41	1.53	9	4.91	1.54	6	4.71	1.62
Photo_28 (CK)	4.60	1.68	6	4.87	1.45	2	4.67	1.46	13	4.70	1.55
Photo_21 (BP)	4.62	1.30	5	4.51	1.15	7	4.81	1.32	9	4.65	1.27
Photo_11 (WL)	4.46	1.46	7	4.57	1.17	6	4.96	1.28	4	4.65	1.34
Photo_26 (WL)	4.34	1.37	13	4.58	1.26	5	4.95	1.21	5	4.61	1.31
Photo_08 (WL)	4.42	1.23	8	4.21	1.18	18	4.98	1.24	3	4.55	1.25
Photo_23 (WL)	4.39	1.41	10	4.47	1.39	8	4.76	1.41	11	4.53	1.41
Photo_20 (WL)	4.37	1.51	11	4.35	1.24	11	4.82	1.29	8	4.51	1.38
Photo_29 (WL)	4.16	1.24	19	4.34	1.26	12	4.75	1.29	12	4.40	1.28
Photo_03 (BP)	4.36	1.36	12	4.27	1.19	17	4.56	1.29	16	4.40	1.29
Photo_30 (BP)	4.41	1.53	9	4.36	1.31	10	4.39	1.38	23	4.39	1.42
Photo_06 (BP)	4.23	1.61	16	4.05	1.35	27	4.80	1.48	10	4.36	1.53
Photo_17 (WL)	4.18	1.49	18	4.31	1.36	15	4.61	1.31	15	4.36	1.41
Photo_01 (CK)	4.25	1.23	14	4.32	1.34	14	4.39	1.40	22	4.32	1.32
Photo_19 (CK)	4.13	1.39	21	4.33	1.17	13	4.50	1.32	17	4.30	1.31
Photo_25 (CK)	4.12	1.46	22	4.27	1.28	16	4.47	1.36	18	4.28	1.38
Photo_16 (CK)	4.34	1.54	13	4.11	1.44	22	4.23	1.56	25	4.24	1.52
Photo_12 (BP)	4.19	1.30	17	4.19	1.17	19	4.34	1.34	24	4.24	1.28
Photo_15 (BP)	4.16	1.60	20	4.09	1.50	24	4.43	1.57	21	4.23	1.56
Photo_09 (BP)	4.25	1.52	15	4.17	1.41	20	4.16	1.55	26	4.20	1.50
Photo_14 (WL)	3.97	1.50	24	3.94	1.30	28	4.61	1.47	14	4.17	1.46
Photo_05 (WL)	3.88	1.48	26	4.09	1.26	25	4.45	1.32	20	4.12	1.39
Photo_07 (CK)	3.84	1.44	27	4.10	1.18	23	4.45	1.38	19	4.11	1.37
Photo_22 (CK)	4.03	1.44	23	4.16	1.26	21	4.07	1.45	28	4.08	1.39
Photo_10 (CK)	3.96	1.54	25	4.06	1.31	26	4.14	1.53	27	4.05	1.47
Photo_24 (BP)	3.77	1.58	28	3.83	1.42	29	3.87	1.50	29	3.82	1.51
Photo_18 (BP)	3.60	1.70	29	3.65	1.49	30	3.63	1.69	30	3.62	1.64

Sorted by mean ratings of “Total”.

Scale: from “1=Don't like it at all” to “7=Like it very much”

BP: Bukit Panjang neighborhood 5 park; CK: Choa Chu Kang neighborhood 7 park; WL: Woodlands neighborhood 6 park

Photo numbers are based on the order of photographs in the photo-questionnaire used in Bukit Panjang neighborhood 5.

Figure 4. 1 Neighborhood Park Landscapes Preferences

M=5.11

2

13

M=4.78

27

4

M=4.70

28

21

M=4.65

11

26

M=4.55

8

23

Figure 4. 2 Neighborhood Park Landscapes Preferences (continued I)

M=4.51

20

29

M=4.40

3

30

M=4.36

6

17

M=4.32

1

19

M=4.28

25

16

Figure 4. 3 Neighborhood Park Landscapes Preferences (continued II)

M=4.24

12

15

M=4.20

9

14

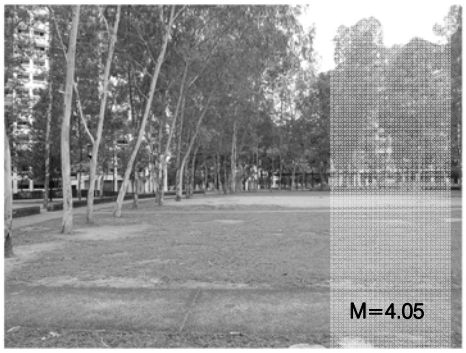
M=4.12

5

7

M=4.08

22



10

M=3.82

24

18

Table 4. 11 Landscape Contents of the photographs (sorted by mean ratings in descending order from left to right)

	Photograph Numbers																													
	Most Preferred Photographs										Moderately Preferred Photographs										Least Preferred Photographs									
Landscape Content	2	13	27	4	28	21	11	26	8	23	20	29	3	30	6	17	1	19	25	16	12	15	9	14	5	7	22	10	24	18
Scattering vegetation	•	•		•		•	•	•	•	•	•	•		•		•	•	•	•	•				•	•	•	•	•		•
Orderly planted vegetation	•	•	•				•	•	•	•	•	•				•	•		•						•	•	•			
Dense vegetation			•	•	•	•							•	•	•		•		•		•	•	•						•	•
Architectural features	•	•	•	•	•	•	•	•	•		•					•		•	•	•	•					•		•		
Straight pathway	•	•					•		•	•	•					•			•						•	•	•	•		
Meandering pathway			•				•	•	•			•	•	•	•		•	•			•	•	•	•						
Hard pavement		•	•			•											•	•								•				
Undulating terrain													•	•	•						•	•	•					•	•
Naturalistic ground		•		•	•									•					•	•		•							•
Smooth lawn			•				•	•	•	•	•	•	•		•	•	•	•	•	•	•		•	•	•		•	•	•	
Street furniture	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•		•					•				
Recreation facilities				•	•				•				•											•						

Photos from Bukit Panjang neighborhood 5 park

Photos from Choa Chu Kang neighborhood 7 park

Photos from Woodlands neighborhood 6 park

"•" indicates that this landscape feature is contained in the current photograph

Exploratory Factor Analysis

Neighborhood park landscape preferences were further analyzed by performing exploratory factor analysis (principle components analysis with varimax rotation) in an attempt to identify the underlying patterns of preferential judgment[26]. Four qualified categories were extracted as the results of factor analysis (Table 4. 12), cumulatively accounting for more than half (52.61%) of the total variance of the preferential ratings. Five photographs and two factors obtained which did not meet the inclusion criterion (refer to section 3.3.1) were excluded from analysis. Each category was labeled after examining the image contents across all photographs comprising the factor (Table 4. 13).

Category 1: Geometric Landscapes (Figure 4. 4). Images within this category were characterized by salient presence of artificial design elements arranged in geometric pattern. The majority of the pictures contained orderly planted vegetation, architectural features such as pavilion and tent, and street furniture such as lamp post and dustbin. All except one picture (photo 21) depict smooth lawn which is clear sign of human intervention. Clear presence of pathways, either straight or curved ones, in most of the photographs provided clues of good orientation. Only two pictures (photo 21 and 27) depicted dense vegetation as background. None of the pictures displayed either undulating terrain or naturalistic ground cover. The ten photographs included in this category accounted for 20.78% of the total variance of this factorial solution. Their factor loadings ranged from 0.41 to 0.78. This grand mean (M=4.52) of this category ranked the second among the four categories and was slightly lower than the most preferred category, the "Manicured Naturalistic Landscapes". Two photographs within this category were taken from Bukit Panjang neighborhood 5 park[27] and the rest were from Woodlands neighborhood 6 park.

Category 2: Natural Landscapes (Figure 4. 5). Images within this category were characterized by the presence of exuberant vegetation. Undulating natural terrain was also a salient feature within these pictures. Together with the meandering pathways, these design features depicted landscapes resembling that of dense forest or jungle. Lacking of orderly planted vegetation, architectural features, straight pathway, hard pavement, street furniture, and recreation facilities further strengthened the image of a naturalistic environment with clear orientation and few sign of human intervention. The seven photographs included in this category accounted for 14.81% of the total variance. Their factor loadings ranged from 0.55 to 0.74. This category received the lowest average rating (M=4.12). All the seven photographs within this category were taken from Bukit Panjang neighborhood 5 park.

Category 3: Manicured Naturalistic Landscapes (Figure 4. 6). The common feature within the four pictures included in this category was the dry stream of the Choa Chu Kang neighborhood 7 park. Though without being informed, participants obviously identified this stream as a design feature that is distinctive from the other landscapes. These four pictures were also characterized by a mixture of natural and artificial design elements. The naturalistic bank of the dry stream and surrounding dense vegetation were shown in company with pavilions, bridge, benches, barbeque tables, garden lamps, and even straight pathway cutting across them. The general

[26] The correlation matrix of the mean ratings of the thirty photos is attached as Appendix E.
[27] These two photographs, photo 27 and photo 21, depict the only two sections of the naturalistic Bukit Panjang neighborhood 5 park that are dominated by landscape in formalistic style.

image was a kind of tamed naturalistic landscape that is somewhat manicured, showing clear human intention to balance the naturalness with artificial elements. This category accounted for 8.91% of the total variance, and the item loadings ranged from 0.67 to 0.76. This group of landscapes as a whole received the highest mean rating (M=4.62). All the four photographs within this category were taken from Choa Chu Kang neighborhood 7 park.

Category 4: Hardscape-Dominated Landscapes (Figure 4. 7). The most salient design feature across the four pictures within this category was pathway, either in curved shape or in straight form, and large area of hardscape . None of the images depicted undulating natural terrain or naturalistic ground cover. The sparse vegetation and the barren ground within these pictures rendered a landscape lacking of recreation opportunities and a setting of poor maintenance. This category accounted for 8.11% of the total variance, and the item loadings ranged from 0.47 to 0.68. The pathway landscape received a slightly higher mean rating (M=4.20) than the natural landscape category. All the four photographs within this category were also taken from Choa Chu Kang neighborhood 7 park.

Six out of the ten photographs within the “Geometric Landscapes” category and three out of the four photographs within the “Manicured Naturalistic Landscapes” belonged to the ten most preferred landscapes, and five out the seven photographs within the “Natural Landscapes” category belonged to the ten lest preferred landscapes. This indicates that the landscapes comprising each preference category were more or less homogeneous in terms of the magnitude of their preferential ratings.

The results clearly indicated that residents did differentiate different types of landscape drawn from the three neighborhood parks under study. It seems that park landscapes with a fine balance between formalistic and naturalistic design styles, and which depict diverse design features, either artificial or natural ones, were most appreciated by residents. Geometric or formalistic park landscapes showing clear intention of manipulating the park environment were also preferred by residents. Clear visual access of the destination along park trail and a sense of order promised by this type of landscape were also regarded by participants as visually appealing. On the other hand, naturalistic landscapes which intend to resemble wildness areas that provide no clue of clear orientation and give low sense of security were least preferred by residents. So did landscapes which contain few intriguing design features and that are dominated by barren ground textures and hard pavement.

Following the exploratory factor analysis new index variable was constructed for each of the four preference categories by computing the mean scores across all photograph items within respective category for each participant.

Table 4. 12 Exploratory Factor Analysis – Park Landscape Preference

Photo	Factor 1: Geometric	Factor 2: Natural	Factor 3: Manicured	Factor 4: Hardscape	Factor 5	Factor 6	Item mean	SD
Photo_17	**0.78**	0.14	0.06	0.02	-0.04	-0.04	4.36	1.41
Photo_29	**0.77**	0.04	0.12	0.13	0.03	0.16	4.40	1.28
Photo_23	**0.76**	0.01	0.07	0.14	0.10	0.24	4.53	1.41
Photo_11	**0.75**	0.08	0.06	0.19	0.14	0.04	4.65	1.34
Photo_20	**0.73**	-0.08	0.01	0.12	0.12	0.01	4.51	1.38
Photo_08	**0.71**	0.18	0.04	0.15	0.25	-0.12	4.55	1.25
Photo_26	**0.69**	0.02	0.07	0.24	0.02	0.30	4.61	1.31
Photo_14	**0.69**	0.20	0.05	0.12	-0.09	-0.16	4.17	1.46
Photo_05	**0.67**	0.17	0.04	0.10	-0.07	**-0.42**	4.12	1.39
Photo_27	**0.59**	-0.01	0.09	0.21	0.33	0.37	4.78	1.31
Photo_21	**0.41**	0.26	0.15	0.21	0.27	0.35	4.65	1.27
Photo_15	0.02	**0.74**	0.29	0.08	0.03	0.15	4.23	1.56
Photo_09	-0.01	**0.73**	0.14	0.21	0.25	0.00	4.20	1.50
Photo_24	0.03	**0.72**	0.18	0.20	-0.20	0.26	3.82	1.51
Photo_18	-0.06	**0.66**	0.29	0.00	-0.31	0.04	3.62	1.64
Photo_30	0.11	**0.63**	0.21	0.04	0.00	**0.46**	4.39	1.42
Photo_03	0.09	**0.61**	0.18	0.08	0.23	-0.10	4.40	1.29
Photo_06	0.26	**0.56**	0.03	0.11	-0.02	-0.22	4.36	1.53
Photo_12	0.39	**0.55**	0.10	0.06	0.25	-0.10	4.24	1.28
Photo_13	0.18	0.12	**0.76**	0.13	0.18	0.00	4.81	1.36
Photo_28	0.12	0.27	**0.74**	-0.01	0.01	0.29	4.70	1.55
Photo_04	0.00	0.37	**0.72**	0.13	0.13	-0.08	4.71	1.62
Photo_16	0.04	0.32	**0.67**	0.31	-0.11	-0.01	4.24	1.52
Photo_07	0.31	0.06	0.18	**0.68**	0.04	-0.16	4.11	1.37
Photo_01	0.09	0.19	0.07	**0.64**	0.29	0.04	4.32	1.32
Photo_19	0.34	0.09	0.21	**0.64**	-0.04	0.14	4.30	1.31
Photo_22	0.30	0.38	0.08	**0.50**	-0.23	0.28	4.08	1.39
Photo_10	**0.42**	**0.41**	0.00	**0.47**	-0.16	0.01	4.05	1.48
Photo_25	0.23	0.37	0.30	0.39	-0.27	0.34	4.28	1.38
Photo_02	0.34	0.09	0.18	0.04	**0.69**	0.05	5.11	1.27
Eigenvalue	9.46	4.04	1.51	1.41	1.09	1.02		
% of Variance explained	20.78	14.81	8.91	8.11	4.65	4.51		
Cumulative variance explained	20.78	35.59	44.50	52.61	57.26	61.78		
Cronbach's alpha	0.91	0.83	0.81	0.71	*	*		
Factor mean	4.52	4.12	4.62	4.20	*	*		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

N=368. Scale: ranging from “1=Don't like it at all” to “7=Like it very much”

*Value was not calculated due to lack of qualified items within this factor

Table 4. 13 Landscape Contents of the Photographs

	Landscape Preference Categories																							
	Geometric Landscape (*M*=4.52)										Natural Landscape (*M*=4.12)							Manicured Naturalistic Landscape (*M*=4.62)				Hardscape-dominated Landscape (*M*=4.20)			
Landscape Content	27	21	11	26	8	23	20	29	17	14	3	6	12	15	9	24	18	13	4	28	16	1	19	7	22
Scattering vegetation		•	•	•	•	•	•	•	•	•							•	•	•		•	•	•	•	•
Orderly planted vegetation	•		•	•	•	•	•	•	•									•				•		•	•
Dense vegetation	•	•									•	•	•	•	•	•	•		•	•		•			
Architectural features	•	•	•	•	•		•		•				•					•	•	•	•		•	•	
Straight pathway			•		•	•	•		•									•						•	•
Meandering pathway	•		•	•	•			•		•	•	•	•	•	•							•	•		
Hard pavement	•	•																•				•	•	•	
Undulating terrain											•	•	•	•	•	•	•								
Naturalistic ground														•			•	•	•	•	•				
Smooth lawn	•		•	•	•	•	•	•	•	•	•	•	•		•	•					•	•	•		•
Street furniture	•	•	•	•	•	•	•	•			•	•	•					•	•	•		•	•	•	
Recreation facilities					•					•	•								•	•					

Photos from Bukit Panjang neighborhood 5 park

Photos from Choa Chu Kang neighborhood 7 park

Photos from Woodlands neighborhood 6 park

"•" indicates that the landscape feature is contained in current photograph

Figure 4. 4 Preference Category 1: Geometric Landscapes

M=4.78

27

21

M=4.65

11

26

M=4.55

8

23

M=4.51

20

29

M=4.36

17

14

Figure 4. 5 Preference Category 2: Natural Landscapes

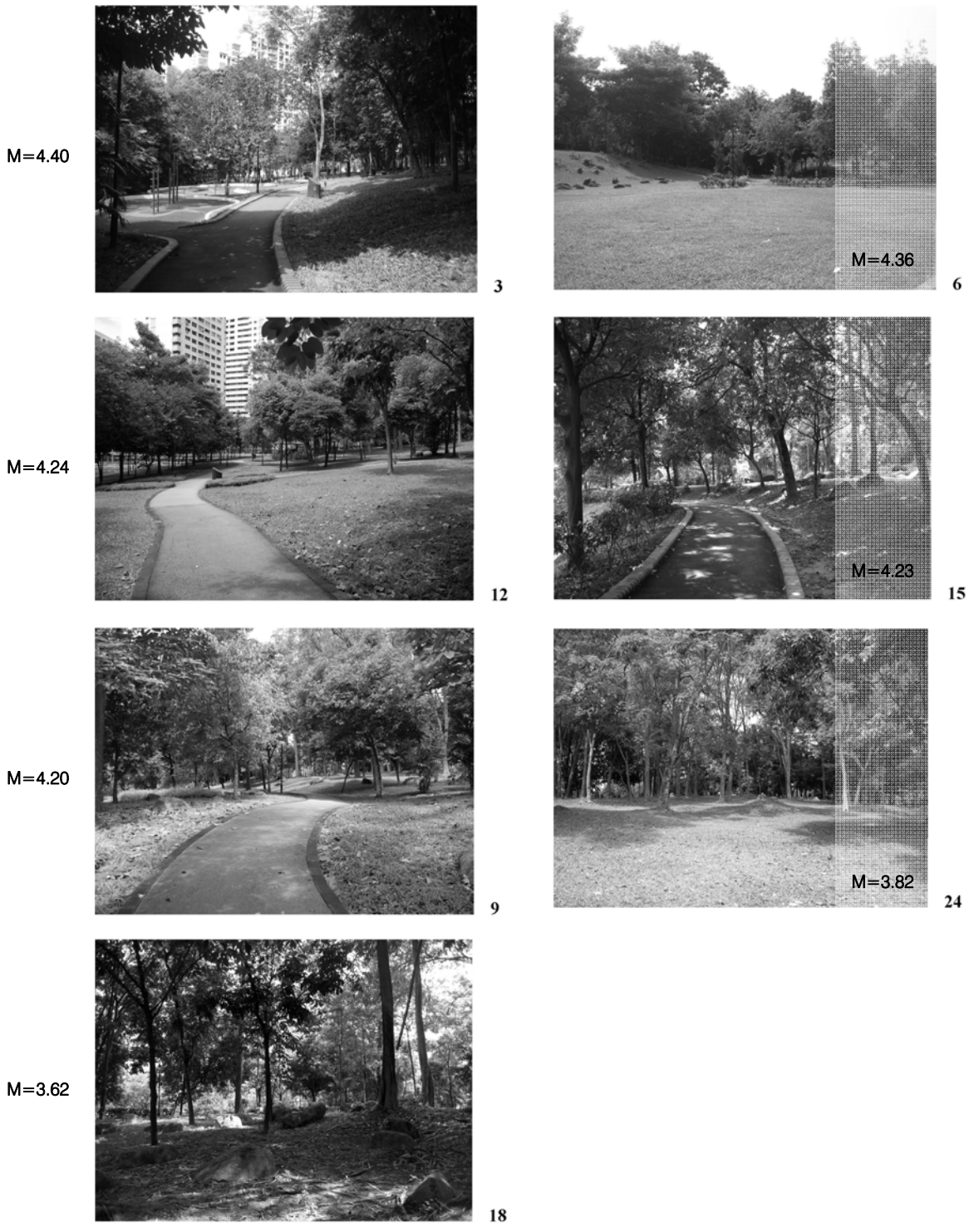


Figure 4. 6 Preference Category 3: Manicured Naturalistic Landscapes

M=4.81

13

4

M=4.70

28

16

Figure 4. 7 Preference Category 4: Hardscape-dominated Landscapes

M=4.32

1

19

M=4.11

7

22

Group Differences regarding Landscape Preferences

One-way analysis of variance (ANOVA) was carried out to identify group differences on preferences of landscape categories. The results revealed that there were significant differences between age groups regarding the mean ratings of the Geometric Landscapes (Table 4. 14). The mean ratings of participants aged 40 to 49 were significantly higher than that of those between 20 to 29. Checking the mean rating of each group also revealed that middle-aged and senior participants generally rated higher on geometric landscapes than did young participants.

Table 4. 14 ANOVA – Differences between Age Groups regarding Mean Ratings for Landscape Preference Categories

Preference Categories	15-19 (N=62)	20-29 (N=66)	30-39 (N=85)	40-49 (N=103)	50-59 (N=36)	>=60 (N=16)	F	Sig.
Geometric landscapes	4.57	4.25[28]	4.43	4.74	4.43	4.70	2.433	0.035
Natural landscapes	4.04	3.94	4.16	4.18	4.14	4.64	1.424	0.215
Manicured naturalistic landscapes	4.49	4.58	4.59	4.70	4.58	4.91	0.446	0.816
Hardscape-dominated landscapes	4.24	3.99	4.21	4.36	4.01	4.31	1.463	0.201

No significant differences were found between male and female participants regarding landscape preference categories. So did length of residence groups. However, significant differences were found between ethnicity groups regarding three of the preference categories (Table 4. 15). Indian participants rated the “Natural Landscapes” and the “Manicured naturalistic landscapes” significantly higher than did Chinese and Malay groups, and Malay participants rated the “Geometric Landscapes” significantly higher than did Chinese participants. These specific differences suggest that individuals of different ethnicities may have different attitudes toward the same type of landscape due to their different cultural backgrounds.

Table 4. 15 ANOVA – Differences between Ethnicity Groups regarding Mean Ratings for Landscape Preference Categories

Preference Categories	Chinese (N=251)	Malay (N=69)	Indian (N=35)	Others (N=13)	F	Sig.
Geometric landscapes	4.40	4.77	4.73	5.05	3.530	0.015
Natural landscapes	4.08	4.02	4.60	4.26	4.608	0.004
Manicured naturalistic landscapes	4.60	4.38	5.18	4.67	2.924	0.034
Hardscape-dominated landscapes	4.15	4.37	4.21	4.35	1.040	0.375

No significant differences between neighborhoods were found, except for the Geometric Landscapes, for which participants from Woodlands rated significantly higher than did Bukit Panjang and Choa Chu Kang groups. Besides, Woodlands participants generally rated higher across all four landscape categories than those from the other two neighborhoods (Table 4. 16).

[28] Throughout this dissertation, results of post hoc tests of ANOVA are based on synthesis of the results of both Tukey HSD and LSD tests (Weinberg & Abramowitz, 2002, p. 354). Values that are significantly different from each other are highlighted in gray, and value in darker gray is significantly higher than that in lighter gray.

Table 4. 16 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Landscape Preference Categories

Preference Categories	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	F	Sig.
Geometric landscapes	4.37	4.40	4.81	7.708	0.001
Naturalistic landscapes	4.08	4.04	4.25	1.457	0.234
Manicured natural landscapes	4.62	4.51	4.71	0.729	0.483
Hardscape-dominated landscapes	4.06	4.23	4.35	2.909	0.056

4.3.2. Perceived Uniqueness of Park Design Features

In order to find out whether residents perceive certain design features in their own neighborhood park as more special than the others, participants were asked to indicate the perceived uniqueness of a variety of design elements within their respective park and the ways that these elements are arranged in comparison with other open spaces.

Descriptive Statistics

The ranking of the mean rating of each item within this “perceived uniqueness” question across the three neighborhoods are shown in Table 4. 17. The results indicate that participants’ responses to these elements varied a lot depending on the salience of each element in their respective parks.

The results of one-way analysis of variance shown that significant differences exist between neighborhoods regarding mean ratings of more than half of the park design features. As to design elements related to active recreation, Woodlands group rated significantly higher on the perceived uniqueness of “fitness corner”, “children’s playground”, “and “sports fields” than did Bukit Panjang and Choa Chu Kang groups. Woodlands participants also rated significantly higher on “the way vegetations are planted”, architectural features, and “outdoor stage or platform” than did Bukit Panjang and Choa Chu Kang groups.

On the other hand, Bukit Panjang participants rated significantly higher on the perceived uniqueness of “species of plants” and “wildlife in the park” than did Choa Chu Kang and Woodlands groups. Moreover, Woodlands group rated significantly lower on both “dry stream, poor, and bridge” and “barbeque fields” than did Bukit Panjang and Choa Chu Kang groups.

The results suggest that participants of each neighborhood did identify the most salient design elements and the spatial organization styles of these elements in their respective parks that possess unique characteristics and are distinctive from that of the other open spaces. To Bukit Panjang participants, the naturalistic physical environment of their park and the associated biodiversity undoubtedly are the most distinctive and representative design features. To Choa Chu Kang participants the interesting group pattern resulted from the overlapped straight and curved pathway system, and the naturalistic dry stream with the pools and bridges connected make their park looks quite distinct from other parks. The reason why Bukit Panjang participants also rated highly on “dry stream, poor, and bridge” item may be because they mistook the water retention pond right adjacent to their neighborhood as a prominent feature of the park. Finally, to Woodlands participants, the geometric pattern of the pathway system that cover the whole

stretch of their park, the orderly planted palm trees along the roads, the neatly trimmed lawn, and the diverse recreation facilities and architectural features, especially the giant tent located at the centre of the park, obviously capture their attentions the most.

Table 4. 17 ANOVA – Differences between Neighborhoods regarding Mean Ratings for Perceived Uniqueness of Park Design Elements

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park Design Features	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
The way the paths and trails are laid out	2.95	1.00	1	2.80	1.11	1	3.07	1.06	1	2.94	1.05	1.853	0.158
Fitness corner	2.65	1.14	6	2.64	1.06	4	3.07	1.13	1	2.78	1.13	5.750	0.003
Land form	2.80	1.01	2	2.60	0.92	7	2.76	0.93	7	2.73	0.96	1.391	0.250
Children's playground	2.42	1.04	13	2.69	1.08	2	2.99	1.13	4	2.68	1.11	8.974	0.000
The way the vegetation are planted	2.67	1.06	4	2.39	0.93	13	2.81	0.96	6	2.64	1.01	5.035	0.007
Tables and benches	2.55	1.10	9	2.62	0.98	5	2.71	1.18	8	2.62	1.10	0.755	0.471
Buildings, pavilions, tents, & pergolas	2.56	1.08	8	2.45	1.05	11	2.82	1.06	5	2.61	1.07	3.745	0.025
Lawn and flowerbed	2.67	2.74	4	2.45	0.99	11	2.66	1.16	10	2.61	1.92	0.492	0.612
Outdoor stage or platform	2.38	1.05	14	2.20	0.93	15	3.07	1.18	1	2.55	1.12	21.217	0.000
Sports fields	2.32	1.17	15	2.52	1.06	8	2.70	1.18	9	2.50	1.15	3.573	0.029
Pattern of the ground pavement	2.49	1.05	11	2.66	1.07	3	2.38	1.10	13	2.50	1.07	1.930	0.147
Lighting features	2.47	1.19	12	2.50	1.05	10	2.54	1.11	12	2.50	1.12	0.135	0.874
Covered walkway	2.29	1.19	16	2.33	1.15	14	2.58	1.22	11	2.40	1.19	2.120	0.122
Species of the plants	2.51	1.03	10	2.09	0.95	16	2.18	1.05	14	2.28	1.03	6.152	0.002
Dry stream, pool, and bridges	2.68	1.20	3	2.61	1.17	6	1.51	0.96	17	2.28	1.24	41.833	0.000
Barbeque field	2.27	1.12	17	2.51	0.98	9	1.82	1.18	16	2.19	1.13	11.790	0.000
Wildlife in the park	2.57	1.19	7	1.95	0.90	17	1.92	1.03	15	2.18	1.10	15.825	0.000

Sorted by mean ratings of "Total".

Scale: 1=Not at all, 2=Slightly, 3=Moderately, 4=Very much, 5=Extremely

Exploratory Factor Analysis

To find out if these design features can be grouped into categories with common characteristics, exploratory factor analysis was conducted by including participants from all the three neighborhoods as a whole (Table 4. 18).

Three categories were extracted and all had reliable internal consistency (Cronbach's alpha ranging from 0.75 to 0.79). The first category was labeled "Artificial Features", since the majority of the items loaded in this factor were artificial design elements, such as "fitness corner", "children's playground", "sports fields", "outdoor stage or platform", "buildings, pavilions, tents, and pergolas". The only deviant item was "lawn and flowerbed", which had the lowest factor loading (λ=0.44). The third category was labeled "Natural Features", as all the items loaded in this category were relevant to natural environment, such as "wildlife in the park", "the way vegetation are planted", "land form", and "plant species". The second category, which had the lowest Cronbach's alpha and the lowest group mean rating, includes "dry stream, pool, and bridges", "barbeque field", and "pattern of the ground pavement". Since no reasonable common characteristics can be identified from these items, it was decided to exclude this category from further analysis.

Following exploratory factor analysis, new index variables, namely "Artificial Features" and "Natural Features", were constructed for the two categories by computing the mean scores

across all items within respective category for each participant. The two variables were significantly correlated (r=0.541, p=0.01). The mean ratings for both perceived uniqueness of artificial features and natural features are relatively low, indicating that respondents did not regard the design features in their respective neighborhood park as unique and the negative feeling is relatively stronger for natural design features.

Table 4. 18 Exploratory Factor Analysis - Perceived Uniqueness of Park Design Elements

Park Design Elements	Factor 1: Artificial Features	Factor 2	Factor 3: Natural Features	Item mean	SD
Fitness corner	**0.80**	0.13	0.06	2.78	1.13
Children's playground	**0.73**	0.08	0.19	2.68	1.11
Sports fields (e.g. basketball court, tennis court)	**0.69**	0.34	0.10	2.50	1.15
Tables and benches	**0.62**	**0.44**	0.23	2.62	1.10
Outdoor stage or platform	**0.61**	0.10	0.22	2.55	1.12
Lighting features	**0.57**	**0.42**	0.26	2.50	1.12
The way the paths and jogging trails are laid out	**0.57**	0.11	**0.43**	2.94	1.05
Buildings, pavilions, tents, and pergolas	**0.53**	0.39	0.31	2.61	1.07
Lawn and flowerbed	**0.44**	0.07	0.22	2.61	1.92
Dry stream, pool, and bridges	-0.06	**0.81**	0.18	2.28	1.24
Barbeque field	0.31	**0.75**	0.11	2.19	1.13
Pattern of the ground pavement	0.32	**0.68**	0.23	2.50	1.07
Covered walkway	**0.54**	**0.55**	0.16	2.40	1.19
Birds, squirrels, and other wildlife living in the park	0.10	0.29	**0.74**	2.18	1.10
The way the vegetation are planted	0.34	0.08	**0.74**	2.64	1.01
Land form (the terrain or the topography)	0.12	0.12	**0.71**	2.73	0.96
Species of the plants	0.32	0.20	**0.69**	2.28	1.03
Eigenvalue	7.15	1.37	1.32		
% of Variance explained	25.14	16.55	16.19		
Cumulative variance explained	25.14	41.69	57.89		
Cronbach's alpha	0.77	0.75	0.79		
Factor mean	2.62	2.33	2.46		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

N=368. Scale: 1=Not at all, 2=Slightly, 3=Moderately, 4=Very much, 5=Extremely

Group Differences regarding Perceived Unique Park Design Features

One-way analysis of variance (ANOVA) was carried out to identify group differences on perceived unique park design features. No significant differences were found between age, gender, ethnicity, and length of residence groups regarding the mean ratings for the two perceived unique design feature categories. The results of ANOVA (Table 4. 19) revealed that there were significant differences between neighborhoods regarding appraisals of the uniqueness of either artificial or natural features, and the findings were consistent with that of the park landscape preference analysis. Post hoc tests indicated that Woodlands participants rated significantly higher than Bukit Panjang and Choa Chu Kang participants in terms of perceived uniqueness of the artificial features in their respective parks, whereas Bukit Panjang participants gave significant higher ratings to the natural features in their park than did Choa Chu Kang participants.

Table 4. 19 ANOVA – Differences between Neighborhoods regarding Mean Ratings for Perceived Unique Design Feature Categories

Park Design Feature Categories	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	F	Sig.
Artificial features	2.50	2.49	2.89	8.099	0.000
Natural features	2.64	2.26	2.42	7.246	0.001

4.4. Experiences within Neighborhood Parks (Place Experience)

This section reports the results related to the questions concerning residents' interactions with nearby neighborhood park. It is assumed that the types and intensities of activities individuals do in neighborhood park may influence the nature and quality of park experiences, which are key factors that may affect the development of attachment to the park. Two types of people-park interactions were explored in this study: recreational activities one might do in the park that involve only himself/herself or his/her family members and park-based social interactions that involve one's friends or neighbors.

4.4.1. Park Activities Alone or with Family

First, participants' were asked to indicate the frequency of a variety of activities they might do alone or with family members in nearby neighborhood park on a 5-point scale. Ranks of the mean ratings of the park activity items are shown in Table 4. 20.

Descriptive Statistics

Across the three neighborhoods, "enjoying the greenery and fresh air" in the park was the most frequently carried out activities, whereas "seating or reading on the bench", "playing football or basketball", "observing wildlife", and "walking pet" were the least performed activities. And generally speaking, participants used the nearby neighborhood for recreation only on a slightly lower than medium frequency, and Bukit Panjang participants had relative fewer park activities than did those from the other two neighborhoods.

Results of one-way analysis of variance (Table 4. 20) revealed that significant differences exist between neighborhoods with respect to the average frequencies of some of the park activities. Bukit Panjang group had significantly less family-member-involved activity than did Woodlands group, and they also played with their children significantly less frequently than did Choa Chu Kang and Woodlands groups. Bukit Panjang participants also had significantly less active recreation. Their frequencies of exercising at the fitness corner and playing ball games were significantly lower than that of Choa Chu Kang and Woodlands groups. Their frequencies of bicycling in the park were also significantly lower than that of Woodlands participants. On the other hands, Woodlands group had significantly less passive recreation, such as "sitting or reading on the bench" and "observing wildlife in the park", than did Choa Chu Kang and Bukit Panjang groups.

Table 4. 20 ANOVA – Differences between Neighborhoods regarding Frequencies of Park Activities

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park Activities	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
Enjoying the greenery and fresh air	2.78	1.35	1	2.99	1.34	1	2.82	1.44	1	2.85	1.38	0.741	0.478
Strolling around	2.64	1.32	2	2.95	1.31	2	2.67	1.34	4	2.74	1.33	1.907	0.150
Jogging	2.58	1.25	3	2.70	1.29	4	2.63	1.34	6	2.63	1.29	0.278	0.757
Walking with my family members	2.38	1.29	4	2.77	1.33	3	2.79	1.33	2	2.62	1.33	3.987	0.019
Exercise at the fitness corner	2.15	1.18	6	2.54	1.30	6	2.72	1.28	3	2.45	1.26	7.385	0.001
Playing with my children	2.08	1.33	8	2.69	1.52	5	2.63	1.44	6	2.43	1.45	7.413	0.001
Watching people around there	2.14	1.25	7	2.47	1.31	7	2.42	1.42	8	2.32	1.33	2.369	0.095
Bicycling	1.91	1.13	10	2.26	1.29	9	2.66	1.48	5	2.25	1.33	10.832	0.000
Taking a rest inside the pavilion	2.20	1.22	5	2.40	1.16	8	2.04	1.18	9	2.20	1.19	2.474	0.086
Sitting or reading on the bench	2.01	1.17	9	2.24	1.25	10	1.86	1.15	11	2.02	1.19	2.950	0.054
Playing football or basketball	1.65	1.04	12	2.14	1.41	11	2.04	1.42	9	1.91	1.29	5.232	0.006
Observing birds, squirrels, or other wildlife	1.86	1.20	11	2.08	1.22	12	1.52	1.00	12	1.81	1.16	6.744	0.001
Walking my pet	1.49	1.06	13	1.54	1.19	13	1.34	1.00	13	1.46	1.08	1.162	0.314
Grand Mean	2.14			2.44			2.32			2.28			
Cronbach's Alpha	0.84			0.84			0.79			0.83			

*Sorted by mean ratings of "Total".

Scale: from "1=Seldom (once a year or less)" to "5=Frequently (almost every day)"

That Bukit Panjang participants had significantly less family-related activities and active recreation than the other two groups might be due to a relative lack of recreation facilities such as sports grounds and fitness corner in their neighborhood park. However, the naturalistic environment of their park seemed to have encouraged their passive recreation such as nature observation. In contrast, the relatively ordered but diverse built environment of the parks of Choa Chu Kang and Woodlands neighborhoods seemed to have provided good supports for family-related activities and active recreation.

Exploratory Factor Analysis

Ranking the mean ratings of park activity items shows us the relative intensity of each activity. However it does not provide further information on the latent structure of residents' park activities. In order to identify the patterns of participants' park-based recreation activities, exploratory factor analysis was performed (Table 4. 21). Three valid factors were extracted, and they accounted for more than half (54.84%) of the total variance. The first factor was labeled "Passive Recreation" as the activity items included in this category were mainly of passive types, such as taking a rest inside the pavilion, observing wildlife in the park, sitting or reading on the bench, watching people around, and walking pet. The second factor was labeled "Be with Family" as the two valid items included represented relationship with one's family members. The third factor was named "Active Recreation" as the four items included in this category represented recreation activities that require an active participation, such as playing ball games, bicycling, exercising at fitness corner, and jogging. Generally speaking, most of the time participants went to the park to enjoy being with their family members or to pursue active recreations, whereas passive recreation was carried out less frequently.

Following exploratory factor analysis, new variable was constructed for each of the three park activity factors by computing the mean scores across all activity items within respective categories for each participant.

Table 4. 21 Exploratory Factor Analysis – Park Activities Alone or with Family

Park Activities	Factor 1: Passive Recreation	Factor 2: Be with Family	Factor 3: Active Recreation	Item mean	SD
Taking a rest inside the pavilion	**0.79**	0.09	0.10	2.20	1.19
Observing birds, squirrels, or other wildlife	**0.71**	0.23	0.03	1.81	1.16
Sitting or reading on the bench	**0.71**	0.19	0.12	2.02	1.19
Watching people around there	**0.65**	0.26	0.15	2.32	1.33
Walking my pet	**0.53**	-0.01	0.08	1.46	1.08
Walking with my family members	0.22	**0.80**	0.13	2.62	1.33
Playing with my children	0.06	**0.79**	0.07	2.43	1.45
Strolling around	**0.41**	**0.56**	0.15	2.74	1.33
Enjoying the greenery and fresh air	**0.50**	**0.55**	0.12	2.85	1.38
Playing football or basketball	0.18	-0.25	**0.79**	1.91	1.29
Bicycling	0.07	0.14	**0.70**	2.25	1.33
Exercise at the fitness corner	0.13	0.37	**0.65**	2.45	1.26
Jogging	0.08	0.35	**0.49**	2.63	1.29
Eigenvalue	4.38	1.45	1.29		
% of Variance explained	22.01	18.31	14.52		
Cumulative variance explained	22.01	40.32	54.84		
Cronbach's alpha	0.76	0.75	0.63		
Factor mean	1.96	2.52	2.31		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
N=368. Scale: from "1=Seldom (once a year or less)" to "5=Frequently (almost every day)"

4.4.2. Park-based Social Interactions

Descriptive Statistics

Participants were also asked to indicate their frequency of social interactions with friends or neighbors that are conducted in their nearby neighborhood park. Generally speaking, participants socialize with their friends and neighbors in nearby neighborhood parks only on an occasional basis (Table 4. 22). Casual chatting (M=2.51) and walking together (M=2.40) were the most frequent types of social interactions participants had in the park. Exercising (M=2.26) in the park, using the park as a gathering place (M=2.21), and taking rest in the park (M=2.08) were also frequently mentioned. In contrast, nearby neighborhood park was less frequently used by participants to play field games together (M=1.95), explore nature (M=1.85), join community activities (M=1.65) or barbeque party (M=1.50), play cards or board games (M=1.48), and discuss or share what one knows about nature (M=1.42).

Results of one-way analysis of variance (Table 4. 22) revealed that "strolling around" was significantly more frequent for Choa Chu Kang group than for Woodlands group, and the former also played ball game significantly more frequently than did Bukit Panjang group. On the other hand, Woodlands sample joined barbeque party significantly less frequently than Bukit Panjang and Choa Chu Kang groups. They also had cards or board games significantly less frequently than did Bukit Panjang group.

Table 4. 22 ANOVA – Differences between Neighborhoods regarding Frequencies of Park-based Social Interactions

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park-based Social Interactions	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
Chatting	2.40	1.32	1	2.75	1.43	1	2.42	1.39	1	2.51	1.38	2.237	0.108
Walking around the park	2.40	1.25	1	2.69	1.38	2	2.17	1.27	3	2.40	1.31	4.480	0.012
Exercising (e.g. jogging, body-building)	2.27	1.19	3	2.30	1.19	4	2.23	1.35	2	2.26	1.24	0.099	0.906
Meeting friends to go to other places	2.23	1.22	4	2.37	1.31	3	2.05	1.30	4	2.21	1.28	1.750	0.175
Taking a rest on the bench or inside the pavilion	2.00	1.09	5	2.29	1.23	5	2.01	1.15	5	2.08	1.15	2.322	0.100
Playing football/basketball/tennis/badminton	1.72	1.10	7	2.26	1.42	6	1.95	1.35	6	1.95	1.29	5.446	0.005
Exploring nature in the park	1.86	1.14	6	2.00	1.19	7	1.71	1.09	7	1.85	1.14	1.753	0.175
Joining in community activities	1.62	1.03	8	1.66	1.00	8	1.68	1.10	8	1.65	1.04	0.717	0.489
Joining in barbeque party	1.59	0.99	9	1.62	0.85	9	1.29	0.75	10	1.50	0.89	4.988	0.007
Playing cards or board games	1.59	1.08	9	1.53	1.06	10	1.29	0.80	10	1.48	1.00	3.119	0.045
Discussing or sharing what I know about nature	1.47	0.89	11	1.45	0.84	11	1.34	0.84	9	1.42	0.86	0.717	0.489
Grand Mean	1.92			2.08			1.83			1.94			
Cronbach's alpha	0.86			0.88			0.85			0.87			

*Sorted by mean ratings of "Total".

N=368. Scale: 1=Seldom (once a year or less), 2=Occasionally (every other month or less), 3=Sometimes (once a month or more), 4=Quite often (once a week or more), 5=Frequently (almost every day)

Exploratory Factor Analysis

Exploratory factor analysis did not yield meaningful categories that may include majority of the interaction items used. Thus, a composite "Park-based Social Interaction" scale was constructed by computing the mean score across all interaction items for each participant. The internal consistence of this composite scale is consistently reliable for each neighborhood ($Alpha_{Bukit\ Panjang}$=0.86, $Alpha_{Choa\ Chu\ Kang}$=0.88, $Alpha_{Woodlands}$=0.85) and for the entire sample ($Alpha_{All}$=0.87).

Group Differences regarding Park Experiences

One-way analysis of variance (ANOVA) was carried out to identify group differences in terms of park-based social interactions and the three different types of park activities. Significant differences were found between age groups regarding the intensities of "Be with Family", "Active Recreation", and "Park-based Social Interactions" (Table 4. 23). It was found that young participants between 15 to 19 had significantly less family activities than did 30-39, 40-49, and 50-59 groups. On the other hand, the results shown that young participants aged 15 to19 had significantly more active recreation than did 50-59 group, and they also had significantly more social interactions than did 30-39, 40-49, and 50-59 group. The results suggested that young residents tend to have more active recreation and social interactions in nearby neighborhood park than did middle-aged and senior residents. However, they did not seem to use the park as a place to be with their family members as often as older residents.

Table 4. 23 ANOVA – Differences between Age Groups regarding People-Park Interactions

People-Park Interactions	15-19 (N=62)	20-29 (N=66)	30-39 (N=85)	40-49 (N=103)	50-59 (N=36)	>=60 (N=16)	F	Sig.
Passive recreation	1.90	1.91	2.06	1.94	1.91	2.19	0.597	0.702
Be with family	1.84	1.98	3.11	2.83	2.53	2.34	13.293	0.000
Active recreation	2.60	2.18	2.36	2.31	2.06	2.01	2.657	0.022
Park-based social interactions	2.27	1.95	1.88	1.85	1.72	1.95	3.600	0.003

The results of ANOVA indicated that female participants tended to have more family-member-involved activities than did male participants, whereas male respondents had significantly more active recreations than did female respondents (Table 4. 24).

Table 4. 24 ANOVA – Differences between Gender Groups regarding People-Park Interactions

People-Park Interactions	Male (N=177)	Female (N=191)	F	Sig.
Passive recreation	1.96	1.97	0.007	0.936
Be with family	2.38	2.66	4.586	0.033
Active recreation	2.46	2.17	10.258	0.001
Park-based social interactions	2.00	1.88	2.511	0.114

It was found that there were significant differences between ethnic groups with respect to all the four types of people-park interactions (Table 4. 25). Indian group had significantly more passive recreations than did Chinese group, and they also had significantly more family-involved activities than did Chinese and Malay groups. It was also revealed that Chinese group had significantly less active recreations than did Malay group, and they also had significantly less social interactions in nearby neighborhood park than did Malay and Indian groups. The results seemed to suggest that Chinese residents are relatively less willing to have outdoor activities, either alone or with family members, or with friends or neighbors in nearby neighborhood parks, compared with the other ethnic groups.

Table 4. 25 ANOVA – Differences between Ethnic Groups regarding Mean Ratings of People-Park Interaction Categories

People-Park Interaction Categories	Chinese (N=251)	Malay (N=69)	Indian (N=35)	Others (N=13)	F	Sig.
Passive recreation	1.88	2.08	2.30	2.08	3.228	0.023
Be with family	2.36	2.61	3.40	2.85	8.083	0.000
Active recreation	2.22	2.55	2.55	2.08	3.802	0.010
Park-based social interactions	1.84	2.21	2.22	1.66	6.861	0.000

The results of ANOVA also revealed that there were significant differences between length-of-residence groups regarding the intensities of people-park interactions (Table 4. 26). Participants who stayed in current HDB flat for less than one year had significantly more passive recreations than did those who had been settled down for 6 to 9 years or longer. Also, 1-3 years residents seemed to have significantly more social interactions than did over-nine-years residents. It was also found that participants' frequency of family-member-involved activities decreased as their lengths of residence increased, though the differences between groups were not significant.

Table 4. 26 ANOVA – Differences between Length of Residence Groups regarding People-Park Interactions

People-Park Interactions	< 1 year (N=13)	1-3 years (N=54)	3-6 years (N=89)	6-9 years (N=88)	> 9 years (N=124)	F	Sig.
Passive recreation	2.65	2.11	2.03	1.95	1.79	4.064	0.003
Be with family	3.23	2.75	2.70	2.44	2.29	3.246	0.012
Active recreation	2.00	2.55	2.37	2.22	2.25	1.812	0.126
Park-based social interactions	1.92	2.22	2.05	1.88	1.78	3.971	0.004

The findings suggest that intensity of passive recreation in nearby neighborhood park tends to drop as length of residence increases. One possible explanation is that residents newly moved in tend to visit the park and have passive recreation in it frequently due to their curiosities to the park environment which might decrease when they are more and more familiar with the park as time passes by.

No significant differences were found between groups regarding intensity of active recreation, although 1-3 years residents' mean score was the highest whereas less-than-one-year residents the lowest. The quantitative relationship between length of residence and park-based social interaction seemed to be in a quadratic form which suggests that the intensity of socialization in park may increase after one moves into a new neighborhood and start to get to know new friends and neighbors, but it may start to decrease after around three years of residence as the social relationships become stable and the fever of frequent socialization cools down.

Significant differences were also found between neighborhoods regarding people-park interactions (Table 4. 27). Post hoc tests revealed that Choa Chu Kang group had passive recreations and social interactions in neighborhood park significantly more frequently than did Woodlands group, whereas Bukit Panjang group had family-involved activities and active recreations less frequently than did Choa Chu Kang and Woodlands groups. The results suggest that the patterns of people-park interactions across the three neighborhoods were not homogenous and Choa Chu Kang participants were relatively more active in terms of the four types of park-based experiences than those from the other two neighborhoods.

Table 4. 27 ANOVA – Differences between Neighborhoods regarding People-Park Interactions

Preference Categories	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	F	Sig.
Passive recreation	1.94	2.15	1.84	3.853	0.022
Be with family	2.23	2.73	2.71	7.082	0.001
Active recreation	2.07	2.41	2.52	9.328	0.000
Park-based social interactions	1.92	2.08	1.83	3.175	0.043

4.5. Evaluation of Neighborhood Park Quality (Place Satisfaction)

This section reports the results related to participants' evaluation of the quality of their nearby neighborhood parks.

Descriptive Statistics

As argued in Chapter Three, level of place satisfaction as results of evaluations of the qualities of various aspects of a setting may have substantial influences on the development of place attachment. In this study, participants were asked to indicate the extent to which they agree with a series of bipolar statements concerning a range of issues pertinent to the quality of the environment of their respective parks. Ranks of the mean ratings of quality evaluation items are shown in Table 4. 28.

One-way analysis of variance revealed that significant differences regarding the mean ratings of some of the park quality items existed mainly between Bukit Panjang and Woodlands participants with Choa Chu Kang participants' scores being close to one of them in different occasions (Table 4. 28).

Post hoc tests revealed that Woodlands participants rated significantly higher on accessibility, comfort feelings, and functionality of their neighborhood park than did Bukit Panjang participants. They also rated cleanness, vegetation maintenance, and facility quality of the park significantly higher than did Choa Chu Kang and Bukit Panjang groups. Moreover, Woodlands sample rated on the General Park Quality Evaluation item significantly higher than did Bukit Panjang and Choa Chu Kang groups.

On the other hand, Bukit Panjang participants rated significantly higher on the natural quality of the park than did Woodlands group. They also gave significantly higher ratings to the quietness and the biodiversity of the park than did Choa Chu Kang and Woodlands groups. However, Bukit Panjang participants' ratings on perceived safety of the park was significantly lower than that of Choa Chu Kang and Woodlands groups.

Table 4. 28 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Park Quality Evaluation Items

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park Quality Evaluation Item	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
I can find my way easily in the park	4.05	1.09	1	4.21	1.19	1	4.22	1.11	2	4.15	1.12	0.909	0.404
The park can be accessed easily	4.00	1.04	2	4.18	0.90	2	4.29	0.85	1	4.14	0.95	3.149	0.044
I feel very comfortable in the park	3.65	1.07	5	3.81	1.00	3	4.04	0.96	4	3.82	1.03	4.887	0.008
I feel very safe in the park	3.39	1.17	12	3.81	1.09	3	4.06	0.96	3	3.72	1.12	12.927	0.000
I feel extremely relaxed in the park	3.73	0.99	4	3.58	0.86	5	3.80	0.88	7	3.71	0.92	1.558	0.212
The park is very clean	3.54	1.03	10	3.52	0.92	6	3.86	0.89	5	3.64	0.96	4.620	0.010
It is well connected with other spaces	3.55	0.98	9	3.51	0.88	7	3.80	0.94	7	3.62	0.94	3.233	0.041
The park is very pleasant	3.58	1.02	7	3.46	0.91	8	3.76	0.93	9	3.60	0.96	2.789	0.063
The park is very quiet	3.77	0.93	3	3.37	0.79	10	3.30	0.91	15	3.51	0.91	11.043	0.000
The vegetation is neatly trimmed	3.34	1.08	13	3.31	0.95	12	3.81	1.03	6	3.48	1.05	8.814	0.000
The park is not crowded at all	3.60	1.02	6	3.33	0.98	11	3.45	0.89	12	3.48	0.97	2.473	0.086
I can do a lot of things in the park	3.21	1.06	17	3.42	1.00	9	3.74	1.00	10	3.44	1.04	8.964	0.000
It is very cool in the park	3.58	1.07	7	3.27	1.01	14	3.28	1.14	16	3.40	1.09	3.569	0.029
Facilities are abundant and are in good condition	3.27	1.00	15	3.21	0.95	15	3.65	1.07	11	3.38	1.02	6.487	0.002
The park is spacious	3.30	1.14	14	3.29	1.05	13	3.45	1.21	12	3.35	1.14	0.681	0.507
The park is extremely scenic	3.24	1.19	16	3.19	0.94	16	3.40	1.19	14	3.28	1.12	1.110	0.331
The park is very natural	3.49	1.16	11	3.17	0.96	17	3.12	1.13	17	3.28	1.11	4.452	0.012
There're many species of wildlife and plants	2.97	1.07	18	2.48	1.08	18	2.37	1.16	18	2.64	1.13	11.074	0.000
General park quality evaluation	3.08	0.75		3.13	0.62		3.36	0.78		3.18	0.73	5.327	0.005

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Considering that Woodlands neighborhood 6 park and Bukit Panjang neighborhood 5 park are representatives of the geometric and naturalistic landscape typology respectively, the results are understandable. It seems that Bukit Panjang participants were relatively more satisfied with the naturalistic environment of their park, especially with respect to its serene atmosphere. They also showed relatively stronger positive appreciation to the biodiversity of their park, even though it was the only item which received consistent negative evaluation across the three neighborhoods, indicating that the forest-like environment of the Bukit Panjang neighborhood 5 park did exert a positive impression among the residents that the park is rich in plant and wildlife species. However, safety concern as a result of the relatively dim and enclosed environment may have decreased the level of general satisfaction. In contrast, the open and orderly environment of Woodlands neighborhood 6 park, its convenience of accessing, its diverse recreation functions, and its good maintenance quality may have fostered a high level of general satisfaction among its users.

Despite these differences, it seems that participants as a whole generally gave neutral to slightly positive evaluations to all the quality items except for the biodiversity item. The relatively high mean ratings of general park quality evaluation item of the three neighborhoods indicate that participants generally did not have negative impression to the overall quality of the environment of their respective parks.

Exploratory Factor Analysis

In order to identify the latent structure of participants' park quality evaluation, exploratory factor analysis was performed and four factors emerged (Table 4. 29). The first factor was labeled "Natural Quality" since the evaluation items included in this category seemed to emphasize various aspect of the condition of the natural environment of neighborhood park, such as scenic quality, biodiversity, spaciousness, naturalness, and coolness. The second factor was named "Orientation and Comfort" as the two evaluation items included in this category seemed to concern the ease of orientation and feeling of comfort within neighborhood park. The rest two factors and some of the items within the first two factors were excluded from further analysis due to either low internal item consistency or cross-loading on two factors. Two new scales were constructed for the first two factors by computing the mean scores across all park quality evaluation items within respective categories for each participant.

Since the two newly constructed park quality evaluation scales involve less than half of the evaluation items used in questionnaire, a new composite "General Park Satisfaction" scale was constructed by computing the mean scores across all the eighteen park quality evaluation items for each participant so that each respondents' general assessment of the park quality can be captured. This new composite scale's internal consistency was consistently high across the three neighborhoods ($Alpha_{Bukit\text{-}Panjang}=0.90$, $Alpha_{Choa\text{-}Chu\text{-}Kang}=0.89$, $Alpha_{Woodlands}=0.89$) and the entire sample ($Alpha_{All}=0.89$). Bivariate correlation analysis (Table 4. 30) indicates that the General Park Satisfaction scale was significantly and positively associated with the mean ratings of the general park quality evaluation item across the three neighborhoods. Both the two scales derived from the factor analysis and the composite General Park Satisfaction scale were included in later analysis so that both the specific and the general aspects of park quality evaluation can be examined simultaneously.

Table 4. 29 Exploratory Factor Analysis – Park Quality Evaluation

Park Quality Evaluation Items	Factor 1: Natural Quality	Factor 2: Orientation & Comfort	Factor 3	Factor 4	Item mean	SD
The park is extremely scenic	**0.74**	0.14	0.30	-0.11	3.28	1.12
There're many species of wildlife and plants	**0.69**	-0.25	0.03	0.23	2.64	1.13
The park is spacious	**0.62**	0.24	0.21	0.17	3.35	1.14
The park is very natural	**0.61**	0.32	-0.10	0.31	3.28	1.11
The park is very pleasant	**0.59**	**0.43**	0.33	0.13	3.60	0.96
It is very cool in the park	**0.53**	0.27	0.07	0.38	3.40	1.09
I can do a lot of things in the park	**0.53**	**0.43**	0.29	-0.19	3.44	1.04
I can find my way easily in the park	0.04	**0.82**	0.03	0.14	4.15	1.12
I feel very comfortable in the park	0.39	**0.68**	0.23	0.09	3.82	1.03
The park can be accessed easily	-0.05	**0.62**	**0.41**	0.14	4.14	0.95
I feel extremely relaxed in the park	**0.42**	**0.53**	0.23	0.28	3.71	0.92
It is well connected with other spaces	**0.40**	**0.50**	0.26	0.08	3.62	0.94
The park is very clean	0.03	0.18	**0.74**	0.27	3.64	0.96
The vegetation is neatly trimmed	0.21	0.19	**0.67**	0.04	3.48	1.05
Facilities are abundant and are in good condition	**0.51**	0.00	**0.65**	-0.05	3.38	1.02
I feel very safe in the park	0.16	**0.49**	**0.56**	-0.07	3.72	1.12
The park is very quiet	0.11	-0.04	0.17	**0.82**	3.51	0.91
The park is not crowded at all	0.13	0.30	0.00	**0.59**	3.48	0.97
Eigenvalue	6.64	1.61	1.41	1.07		
% of Variance explained	19.67	17.33	13.63	8.95		
Cumulative variance explained	19.67	37.00	50.63	59.59		
Cronbach's alpha	0.76	0.70	0.57	0.43		
Factor mean	3.19	3.99	3.56	3.49		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

N=368. Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Table 4. 30 Correlation between General Park Quality Evaluation and the Composite Park Satisfaction Scale

	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	Total (N=368)
General park quality evaluation item	3.08	3.13	3.36	3.18
Composite general park satisfaction scale	3.51	3.45	3.63	3.53
Pearson correlation	0.654**	0.468**	0.628**	0.606**

** Pearson correlation is significant at 0.01 level (2-tailed)

Group Differences regarding Park Quality Evaluation

No significant differences were found between age, gender, and length of residence groups regarding mean ratings of the park evaluation factors and the General Park Satisfaction scale. However, significant differences were found between Indian group and the other two groups (Table 4. 31). Indian group had significantly higher ratings on “Natural quality” than did Chinese group. In terms of the composite General Park Satisfaction scale, Indian group rated significantly higher than did both Chinese and Malay groups.

Table 4. 31 ANOVA – Differences between Ethnic Groups regarding Park Quality Evaluation

Park Quality Evaluation Scale	Chinese (N=251)	Malay (N=69)	Indian (N=35)	Others (N=13)	F	Sig.
Factor 1: Natural quality	3.13	3.19	3.54	3.37	3.111	0.026
Factor 2: Orientation & comfort	4.00	3.87	4.26	3.77	1.549	0.201
General park satisfaction scale	3.50	3.48	3.83	3.67	3.388	0.018

Significant difference was also found between neighborhoods. Woodlands group rated the "orientation and comfort" aspects of their park significantly higher than did Bukit Panjang group. Although the between-group differences are not significant, Bukit Panjang participants rated higher on the natural quality of their park than did Choa Chu Kang and Woodlands participants (Table 4. 32). This suggests that the ordered geometric pattern and the clear view of the landscape of Woodlands neighborhood 6 park may have exerted positive influences on their residents' assessments on its capacity to facilitate orientation and provide physical comfort, whereas the landscapes meandering pathways and dim and humid environment of Bukit Panjang neighborhood 5 park may have resulted in the low ratings of their residents.

Table 4. 32 ANOVA – Differences between Neighborhoods regarding Mean Ratings Park Quality Evaluation Factors

Park Quality Evaluation Items	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	F	Sig
Factor 1: Natural quality	3.32	3.08	3.12	3.260	0.040
Factor 2: Orientation & comfort	3.85	4.01	4.13	2.903	0.056
General park satisfaction scale	3.51	3.45	3.63	2.523	0.082

4.6. Identification with Neighborhood Park Meanings (Place Meanings)

As integrated parts of the residential environment of the HDB new towns and the urban open space system, neighborhood parks may represent diverse meanings to individuals depending on their backgrounds and how they perceive, experience, and evaluate the parks. It is argued that the extent to which residents identify with the meanings attributed to neighborhood parks may have substantial and crucial impacts on their attachments to the parks. This section presents the results related to the question concerning neighborhood park meanings.

Descriptive Statistics

Participants were asked what their nearby parks essentially represent on a 5-point Likert scale. Eleven statements were included that encompass a wide range of meanings that neighborhood parks may hold to residents, to the neighborhood and community, and to the nation and regional environment. The mean ratings of these items and their ranks are shown in Table 4. 33.

Generally speaking, participants' responses to most of the park meaning items range from neutral to slightly positive. They agreed the most that their neighborhood parks are places for recreation and privacy, and they are parts of the city's green network. Participants also agreed that neighborhood park represents the neighborhood they live in and it is a place for socialization.

To a lesser extent did participants agree that their park is part of the earth's eco-system, a platform for community life, and a representation of "The Garden City of Singapore". Participants agreed the least that their parks are urban forest, places forgotten by residents, or unpopular places. The last three items are the only ones that received negative responses.

Post hoc tests of one-way analysis of variance (Table 4. 33) further revealed that Bukit Panjang participants were significantly more likely to agree that their park is a quiet and peaceful place to stay alone and it resembles an urban forest than did Woodlands and Choa Chu Kang participants. On the other hand, Woodlands group agreed to a significantly greater extent that their park is a representation of their neighborhood and it is a socializing place than did Choa Chu Kang and Bukit Panjang groups. They also disagreed to a significantly larger degree to the statements that the park is a forgotten place and nobody would like to visit it than did the other two groups.

The results suggest that Bukit Panjang participants identified strongly with the forest-like natural landscape of their park and its serene and relatively unpopulated environment. In contrast, the strong visual image of the Woodland neighborhood 6 park that is represented by the predominant geometric landscape pattern and architectural features such as the giant tent and its well-supported recreation functionality may have enhanced the embedded meanings with which its residents identified that the park represents a strong identity of their neighborhood and it is a quite popular place for either recreation or socialization.

Table 4. 33 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Park Meaning Items

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park Meaning Item	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
It is a place of recreation	3.45	0.88	4	3.52	0.71	1	3.66	0.83	1	3.54	0.82	2.043	0.131
It is a part of the city's overall green open space network	3.48	0.89	3	3.45	0.74	2	3.54	0.85	3	3.49	0.84	0.344	0.709
It is a quiet and peaceful place to stay alone	3.55	0.91	1	3.45	0.79	2	3.29	0.94	7	3.44	0.89	3.018	0.050
It is a representation of the neighborhood I live in	3.37	0.83	5	3.28	0.73	6	3.56	0.86	2	3.41	0.82	3.557	0.030
It is a socializing place	3.21	0.97	8	3.43	0.79	4	3.52	0.85	4	3.37	0.89	4.272	0.015
It is a part of the natural eco-system of the earth	3.49	0.87	2	3.23	0.85	7	3.33	0.90	5	3.37	0.88	2.828	0.060
It is a platform of my community life	3.24	0.94	7	3.35	0.74	5	3.33	0.98	5	3.30	0.90	0.535	0.586
It is a representation of 'the Garden City of Singapore'	3.28	0.98	6	3.20	0.91	8	3.29	0.99	7	3.26	0.96	0.279	0.757
It is an urban forest	3.17	0.91	9	2.83	0.97	9	2.65	0.94	9	2.90	0.96	10.766	0.000
It is a place that has been forgotten by residents	2.61	0.99	10	2.68	0.95	10	2.34	1.07	10	2.54	1.01	3.781	0.024
It is a place that nobody would like to go	2.36	0.97	11	2.21	0.96	11	1.96	0.92	11	2.19	0.96	5.810	0.003

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Exploratory Factor Analysis

In order to identify potential sub-categories of the meanings which are agreed with by participants exploratory factor analysis was performed and two factors were extracted (Table 4. 34). The first factor included a variety of meaning items which have no clear-cut common theme. Thus, this factor was labeled the "General Park Meaning" and it accounted for 32.4% of the total variable variance with reliable internal item consistency (Alpha=0.81). All the items comprising

this factor had factor loadings bigger than 0.5, indicating that scores on these items are all highly correlated with scores on this factor. Among the items included in this factor, "It is a representation of 'the Garden City of Singapore'" had the highest loading (λ=0.73), followed by identification with the neighborhood park as a place for socialization, a part of the city's green network, and a platform of community life. To a lesser degrees was neighborhood park recognized as a representation of the neighborhood, a part of the natural eco-system or a place for recreation were associated with this factor. Neighborhood park as a quiet place for privacy had the lowest loading.

The second factor extracted included three items which imply that nearby neighborhood parks are unpopulated places. The mean ratings of all the three items were below 3, indicating that participants more or less disagreed that their parks are dense woodlands or deserted places which present no attraction to residents. This factor was excluded from further analysis due to low internal item consistency (Alpha=0.59). Following exploratory factor analysis a new "General Park Meaning" scale was constructed for the first park meaning factor extracted by computing the mean scores across all meaning items within this category for each participant.

Table 4. 34 Exploratory Factor Analysis – Identification with Park Meanings

Park Meaning Items	Factor 1: General Park Meaning	Factor 2	Item mean	SD
It is a representation of 'the Garden City of Singapore'	**0.73**	-0.06	3.26	0.96
It is a socializing place	**0.70**	-0.22	3.37	0.89
It is a part of the city's overall green open space network	**0.70**	0.00	3.49	0.84
It is a platform of my community life	**0.70**	-0.17	3.30	0.90
It is a representation of the neighborhood I live in	**0.62**	0.10	3.41	0.82
It is a part of the natural eco-system of the earth	**0.61**	0.25	3.37	0.88
It is a place of recreation	**0.60**	-0.17	3.54	0.82
It is a quiet and peaceful place to stay alone	**0.57**	0.04	3.44	0.89
It is a place that has been forgotten by residents	-0.07	**0.76**	2.54	1.01
It is an urban forest	0.23	**0.72**	2.90	0.96
It is a place that nobody would like to go	-0.24	**0.68**	2.19	0.96
Eigenvalue	3.59	1.73		
% of Variance explained	32.40	15.95		
Cumulative variance explained	32.40	48.35		
Cronbach's alpha	0.81	0.59		
Factor mean	3.40	2.54		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
N=368. Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Group Differences regarding Identification with Park Meanings

One-way analysis of variance revealed that there were significant differences between young and older residents regarding mean ratings of some of the park meaning items (Table 4. 35). Participants who are older than 60 were significantly more likely to agree that neighborhood parks are places for recreation or places to acquire privacy than did 15-19 and 20-29 groups. Participants aged 40 to 49 were significantly more likely to agree that neighborhood parks are symbols of "the Garden City of Singapore" than did 20-29 group. On the other hand, 15-19 group agreed to a significantly greater extent that neighborhood parks are representation of

neighborhood identity than did 12-29 group. It was also found that participants older than 40 tended to had higher rating on the General Park Meaning item than did those aged 20 to 29.

Bivariate correlation analysis further confirmed that the General Park Meaning scale was significantly and positively correlated with age (r=0.15, p<0.01), suggesting that as residents grow old they will become more and more likely to identify with the diverse meanings symbolized by nearby neighborhood parks.

Table 4. 35 ANOVA – Differences between Age Groups regarding Identification with Park Meanings

People-Park Interactions	15-19 (N=62)	20-29 (N=66)	30-39 (N=85)	40-49 (N=103)	50-59 (N=36)	>=60 (N=16)	F	Sig.
It is a place of recreation	3.35	3.48	3.52	3.58	3.64	4.06	2.193	0.055
It is a platform of my community life	3.35	3.12	3.15	3.36	3.53	3.69	2.186	0.055
It is a quiet and peaceful place to stay alone	3.55	3.24	3.39	3.41	3.56	4.00	2.334	0.042
It is a representation of 'the Garden City of Singapore'	3.35	2.88	3.22	3.42	3.42	3.38	3.074	0.010
It is a socializing place	3.37	3.17	3.27	3.46	3.56	3.81	2.225	0.051
It is a part of the city's overall green open space network	3.37	3.27	3.51	3.60	3.67	3.63	1.952	0.085
It is a place that has been forgotten by residents	2.71	2.55	2.49	2.49	2.56	2.44	0.473	0.796
It is an urban forest	2.73	2.88	3.02	2.86	3.03	3.06	0.938	0.457
It is a representation of the neighborhood I live in	3.56	3.14	3.38	3.41	3.56	3.75	2.780	0.018
It is a part of the natural eco-system of the earth	3.34	3.17	3.33	3.51	3.42	3.44	1.351	0.242
It is a place that nobody would like to go	2.27	2.17	2.20	2.17	2.25	1.81	0.626	0.680
General Park Meaning scale	3.41	3.18	3.35	3.47	3.54	3.72	3.848	0.002
Cronbach's Alpha	0.74	0.80	0.82	0.80	0.88	0.82		

No significant differences were found between gender, ethnicity, and length of residence groups with regard to either mean ratings of park meaning items or the General Park Meaning scale. Correlation between the General Park Meaning scale and length of residence was also not significant. Although significant differences were found between neighborhoods regarding mean ratings of some of the meaning items (refer to Table 4. 33), there were no significant differences between neighborhoods in terms of the participants' ratings of the General Park Meaning scale.

4.7. Park-related Attitudes and Behaviors (Place-related Attitudes and Behaviors)

As discussed in Chapter Two, place attachment is not the end in itself. It has important attitudinal and behavioral implications that are relevant to how a place should be planned, designed, and managed. This section presents the results related to participants' responses to the measures of park-related attitudes and behaviors.

4.7.1. Preferences of Park Upgrade Proposals

Descriptive Statistics

In order to examine how residents' attachment to nearby neighborhood parks may influence their attitudes toward park management, participants were asked to indicated the extent to which they agree with a series of park upgrade proposals on a 5-point Likert scale. The mean rating and ranking of each park upgrade item are shown in Table 4. 36.

Generally speaking, participants expressed neutral to relatively positive support to majority of the park upgrade proposals. The only three proposals with which respondents did not agree were “building small shops” (M=2.99), “remove plants to create lawns for football” (M=2.94), and “build coffee shop” (M=2.74), indicating that respondents did not favor having local commercial development in their parks or proposals that destroy plants solely for recreation functions.

One-way analysis of variance (Table 4. 36) revealed that significant differences between neighborhoods existed on only six of the thirty five park upgrade items. Choa Chu Kang participants rated significantly lower on “add sign boards to explain plants and wildlife in the park” and “trim lawns and shrubs along the paths regularly” than did Bukit Panjang and Woodlands participants. However, Choa Chu Kang participants gave significantly greater support to proposals to “create more trails for jogging” than did Bukit Panjang participants. On the other hand, Woodlands participants were more supportive to “plant trees in orderly manner along path” and “create more sports fields” than did Bukit Panjang participants. They also preferred to have more places for barbeque or picnic than did Bukit Panjang and Choa Chu Kang groups.

Table 4. 36 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Park Upgrade Proposals

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Park Upgrade Proposals	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
Enforce strict regulations on litter and vandalism	3.95	0.85	1	3.97	0.85	2	4.03	0.83	1	3.98	0.84	0.258	0.773
Increase the size of the park	3.88	0.96	4	3.99	0.94	1	4.01	0.88	2	3.95	0.93	0.698	0.498
Add more lighting features along the path	3.91	0.92	2	3.83	0.81	6	3.87	0.86	7	3.88	0.87	0.294	0.746
Plant more shady trees	3.71	0.98	10	3.96	0.84	3	3.86	0.93	9	3.83	0.93	2.268	0.105
Add sign boards to explain the plants or wildlife in the park	3.91	0.95	2	3.57	0.96	21	3.89	0.93	5	3.81	0.95	4.530	0.011
Trim lawns and shrubs along the paths regularly	3.84	0.85	5	3.59	0.80	19	3.95	0.81	3	3.81	0.83	5.413	0.005
Create water features	3.71	1.09	10	3.76	0.99	10	3.93	1.09	4	3.80	1.07	1.499	0.225
Add more tables and benches for rest	3.80	0.97	6	3.80	0.87	8	3.79	0.90	13	3.80	0.92	0.005	0.995
Upgrade the facilities of children's playground	3.66	0.92	13	3.88	0.95	4	3.87	0.92	7	3.79	0.93	2.495	0.084
Introduce more species of plants	3.76	0.92	7	3.78	0.85	9	3.80	0.81	12	3.78	0.86	0.063	0.939
Grow more flower trees and shrubs	3.76	0.86	7	3.76	0.77	10	3.77	0.86	16	3.76	0.83	0.012	0.988
Build multipurpose building for activities in raining days	3.75	0.99	9	3.70	1.01	13	3.83	0.96	10	3.76	0.98	0.528	0.590
Create more trails for jogging	3.54	0.93	19	3.85	0.82	5	3.78	0.86	15	3.71	0.88	4.518	0.012
Cut overgrown plants to allow seeing through the woods	3.61	1.01	15	3.70	0.84	13	3.74	0.94	18	3.68	0.94	0.661	0.517
Let plants grow naturally to create an organic landscape	3.70	0.90	12	3.58	0.82	20	3.66	0.89	19	3.65	0.87	0.543	0.581
Plant trees in an orderly manner along the path	3.48	0.98	21	3.75	0.97	12	3.79	0.92	13	3.65	0.96	4.129	0.017
Create more sports fields	3.41	1.16	25	3.70	1.04	13	3.88	0.91	6	3.64	1.07	6.787	0.001
Create quiet reading places	3.58	0.97	17	3.80	0.86	7	3.58	1.02	23	3.64	0.96	1.878	0.154
Build more fitness corners	3.60	0.94	16	3.62	0.91	18	3.66	0.84	19	3.62	0.90	0.143	0.866
Add more architectural shelters	3.65	0.94	14	3.51	0.98	24	3.61	1.01	21	3.60	0.97	0.604	0.547
Extend the covered walkways	3.45	1.13	23	3.64	1.05	17	3.75	1.00	17	3.60	1.07	2.630	0.073
Create more places for barbeque or picnic	3.48	1.06	21	3.48	0.98	26	3.81	1.03	11	3.58	1.04	4.130	0.017
Plant vegetation in natural ways as in the forest	3.56	0.85	18	3.55	0.86	22	3.52	0.98	26	3.55	0.90	0.072	0.931
Arrange shrubs and flowerbeds in geometric patterns	3.38	0.93	28	3.65	0.81	16	3.61	0.89	21	3.53	0.89	3.453	0.033
Create art corners for youth and artists to show art works	3.49	1.05	20	3.52	1.00	23	3.55	1.04	24	3.52	1.03	0.088	0.915
Introduce more tropical plants	3.36	1.04	30	3.51	0.85	24	3.53	0.96	25	3.46	0.97	1.312	0.271
Replant the empty park land with dense vegetation	3.40	1.00	26	3.46	0.97	28	3.41	1.06	30	3.42	1.01	0.088	0.916
Create undulating natural terrains like a rolling hill	3.38	0.98	28	3.41	0.91	29	3.40	1.04	31	3.39	0.98	0.038	0.963
Build outdoor theatre or stage for performance and play	3.42	1.07	24	3.24	1.10	32	3.44	1.08	28	3.38	1.08	1.083	0.340
Build interesting landmark for the entrance	3.40	1.04	26	3.29	1.11	30	3.42	1.12	29	3.38	1.08	0.441	0.644
Create art works representing cultures of different races	3.31	1.08	31	3.29	1.06	30	3.47	1.08	27	3.36	1.08	1.006	0.367
Create adventure playground for roller-skating or scooter	3.12	1.23	32	3.48	1.17	26	3.39	1.08	32	3.31	1.17	3.158	0.044
Build small shops of everyday groceries there	3.01	1.29	33	2.99	1.20	34	2.97	1.30	33	2.99	1.26	0.032	0.969
Remove trees and shrubs to create lawns for football	2.89	1.15	34	3.01	1.14	33	2.93	1.29	34	2.94	1.19	0.301	0.740
Build coffee shop there	2.86	1.28	35	2.72	1.23	35	2.61	1.35	35	2.74	1.29	1.331	0.265

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Exploratory Factor Analysis

In order to identify the underlying dimensions of respondents' responses to the park upgrade proposals, exploratory factor analysis was performed and seven valid categories were extracted which accumulatively accounted for 53.24% of the total variance of participants' responses (Table 4. 37).

The first category was termed "Create Naturalistic Landscapes". This category included four items which reflect support for proposals that create park landscape of a naturalistic style, such as "plant vegetation in natural ways as in the forest" (M=3.55), "let plants grow naturally to create an organic landscape" (M=3.65), "replant empty park land with dense vegetation"

(M=3.42), and “grow more flower trees and shrubs” (M=3.76). This factor accounted for 9.24% of the total variance and its alpha value was 0.77. The factor loadings of the items ranged from 0.57 to 0.81.

The second category was termed “Add Cultural Contents”, since the items included in this category emphasized investing cultural information and meanings in landscape creation. The four items included represented support for proposals that may encourage creating art works representing cultures of different races of Singapore’s populations (M=3.36) and building outdoor settings for cultural performance or play (M=3.38), or encourage artistic activities by providing spatial settings in the park for youth and artists (M=3.52) or facilitate outdoor adventure activities for children and youth (M=3.31). This factor accounted for 8.82% of the total variance and its alpha value was 0.77. The factor loadings of the items ranged from 0.60 to 0.75.

The third category was termed “Increase Human Interventions”. The four items included in this category emphasized park management strategies that intend to increase human manipulation of park environment, such as “cut overgrown plants to allow people to see through the woods” (M=3.68), “trim lawns and shrubs along paths regularly” (M=3.81), “arrange shrubs and flowerbeds in geometric patterns” (M=3.53), and “enforce strict regulations on litter and vandalism” (M=3.98). This factor accounted for 8.63% of the total variance and its alpha value was 0.71. The factor loadings of the items ranged from 0.52 to 0.75.

The fourth category was termed “Facilitate Active Recreation”, since the four proposals included in this category emphasized the support for active recreation activities, such as “create more trails for jogging” (M=3.71), “create more sports fields” (M=3.64), “upgrade facilities of children’s playground” (M=3.79), and “create more places for barbeque or picnic” (M=3.58). This factor accounted for 7.30% of the total variance and its alpha value was 0.68. The factor loadings of the items ranged from 0.49 to 0.72.

The fifth category was termed “Add Architectural Elements”, since the proposals included in this category emphasized support for architectural features in park, such as “add architectural shelters” (M=3.60), “extend covered walkways” (M=3.60), “create quiet reading places” (M=3.64), and “add tables and benches for rest” (M=3.80). This factor accounted for 6.95% of the total variance and its alpha value was 0.69. The factor loadings of the items included ranged from 0.53 to 0.70.

The sixth category was termed “Add Natural Design Elements”, since the proposals included in this category supported design elements of natural forms, such as “creating undulating natural terrains like a rolling hill” (M=3.39), “create water feature” (M=3.80), “introduce more tropical plants” (M=3.46), and “build interesting landmark for the entrance” (M=3.38). This factor accounted for 6.28% of the total variance and its alpha value was 0.73. The factor loadings of items included ranged from 0.41 to 0.64.

The seventh category was termed “Commercial Development”. The only two proposals included in this category emphasized local commercial development in neighborhood park, such as

building small shops of everyday groceries (M=2.99, λ=0.80) and building coffee shop in the park (M=2.74, λ=0.75). This category was the only one that received a group mean rating that was below 3, indicating that participants held negative attitudes toward local commercial development proposals. This factor accounted for 6.01% of the total variance and its alpha value was 0.74.

The results indicate that residents generally expressed fairly positive attitudes towards the majority of the design and management proposals suggested for possible neighborhood upgrade programme. However, their responses to different types of park upgrade proposals varied. Residents were most supportive to proposals that intend to increase human intervention to park environment, followed by facilitating active recreation, adding architectural design features, creating naturalistic landscape, adding natural design elements, and adding cultural contents. Commercial development was the only type of proposal which residents did not support.

Following exploratory factor analysis seven new scales were constructed for the “park upgrade proposal preference” factors extracted by computing the mean scores across all items comprising each category for each participant.

Table 4. 37 Exploratory Factor Analysis – Preference for Park Upgrade Proposals

Park Upgrade Proposal	Factor 1: Create Naturalistic Landscapes	Factor 2: Add Cultural Contents	Factor 3: Increase Human Interventions	Factor 4: Facilitate Active Recreation	Factor 5: Add Architectural Elements	Factor 6: Add Natural Design Elements	Factor 7: Commercial Development	Factor 8	Item mean	SD
• Plant vegetation in natural ways as in the forest	**0.81**	-0.03	-0.03	0.04	0.09	0.14	0.02	-0.04	3.55	0.90
• Let plants grow naturally to create an organic landscape	**0.79**	0.14	0.09	0.04	0.00	-0.04	-0.06	0.04	3.65	0.87
• Replant empty park land with dense vegetation	**0.69**	0.09	0.08	0.00	0.01	0.25	0.18	-0.02	3.42	1.01
• Grow more flower trees and shrubs	**0.57**	0.00	0.24	0.11	0.17	0.22	-0.09	0.17	3.76	0.83
• Increase the size of the park	0.36	0.21	0.15	0.26	0.01	0.19	0.10	0.16	3.95	0.93
• Create art works representing cultures of different races	0.06	**0.75**	0.16	-0.06	0.14	0.18	0.12	0.06	3.36	1.08
• Build outdoor theatre or stage for performance and play	0.05	**0.73**	0.15	0.06	0.17	-0.01	0.13	0.02	3.38	1.08
• Create art corners for youth and artists to show art works	0.16	**0.72**	0.03	0.19	0.06	0.14	0.01	0.13	3.52	1.03
• Create adventure playground for roller-skating or scooter	0.02	**0.60**	-0.03	0.26	0.16	0.18	0.25	-0.13	3.31	1.17
• Build multipurpose building	0.10	**0.51**	**0.40**	0.19	0.10	-0.02	0.13	-0.19	3.76	0.98
• Cut overgrown plants to allow people to see through the woods	0.07	0.05	**0.75**	0.02	0.16	0.00	0.02	-0.15	3.68	0.94
• Trim lawns and shrubs along the paths regularly	0.10	0.18	**0.71**	0.05	0.16	0.05	-0.01	-0.01	3.81	0.83
• Arrange shrubs and flowerbeds in geometric patterns	0.02	-0.04	**0.64**	0.09	0.24	0.22	0.03	0.13	3.53	0.89
• Enforce strict regulations on litter and vandalism	0.16	0.22	**0.52**	0.21	0.04	-0.22	-0.17	0.30	3.98	0.84
• Add sign boards to explain the plants & wildlife in the par	0.21	**0.42**	**0.44**	0.14	-0.03	0.26	-0.12	0.02	3.81	0.95
• Create more trails for jogging	0.11	0.04	0.19	**0.72**	0.03	0.12	0.12	0.08	3.71	0.88
• Create more sports fields	0.00	0.18	0.13	**0.71**	0.09	0.09	0.31	0.00	3.64	1.07
• Upgrade the facilities of children's playground	0.01	0.07	0.11	**0.53**	0.37	0.32	-0.24	-0.22	3.79	0.93
• Build more fitness corners	0.05	0.12	0.09	**0.49**	**0.42**	-0.01	0.03	-0.32	3.62	0.90
• Create more places for barbeque or picnic	0.11	0.32	-0.16	**0.49**	0.10	0.08	0.25	0.20	3.58	1.04
• Add more lighting features along the path	0.22	0.09	0.32	0.34	0.28	-0.29	-0.08	0.15	3.88	0.87
• Add more architectural shelters	0.04	0.17	0.23	0.04	**0.70**	0.06	0.14	0.04	3.60	0.97
• Extend the covered walkways	0.00	0.07	0.19	0.02	**0.63**	0.10	0.24	0.03	3.60	1.07
• Create quiet reading places	0.17	0.22	0.04	0.22	**0.58**	0.17	-0.05	0.33	3.64	0.96
• Add more tables and benches for rest	0.26	0.14	0.24	0.22	**0.53**	-0.04	0.05	-0.05	3.80	0.92
• Create undulating natural terrains like a rolling hill	0.39	0.13	0.00	0.01	0.17	**0.64**	-0.01	0.06	3.39	0.98
• Create water features	0.22	0.15	0.16	0.25	-0.06	**0.57**	0.18	0.02	3.80	1.07
• Introduce more tropical plants	0.33	0.18	0.01	0.15	0.11	**0.53**	-0.04	0.22	3.46	0.97
• Introduce more species of plants	**0.49**	0.20	0.17	0.06	0.12	**0.50**	-0.07	0.13	3.78	0.86
• Build interesting landmark for the entrance	0.02	0.19	0.34	0.10	0.29	**0.41**	0.35	-0.11	3.38	1.08
• Build small shops of everyday groceries there	0.04	0.15	0.04	0.23	0.06	0.02	**0.80**	-0.02	2.99	1.26
• Build coffee shop there	0.00	0.13	-0.09	0.05	0.19	0.03	**0.75**	0.02	2.74	1.29
• Plant more shady trees	**0.41**	0.10	0.00	0.09	0.30	0.24	0.07	**0.51**	3.83	0.93
• Plant the trees in an orderly manner along the path	0.04	0.16	**0.49**	0.17	0.10	0.21	0.11	**0.50**	3.65	0.96
• Remove trees and shrubs to create lawns for football	-0.01	0.18	0.07	0.26	0.06	0.00	**0.43**	**-0.49**	2.94	1.19
Eigenvalue	8.41	2.97	2.29	1.59	1.33	1.27	1.14	1.07		
% of Variance explained	9.24	8.82	8.63	7.30	6.95	6.28	6.01	4.10		
Cumulative variance explained	9.24	18.06	26.69	34.00	40.95	47.23	53.24	57.35		
Cronbach's alpha	0.77	0.77	0.71	0.68	0.69	0.73	0.74	*		
Factor mean	3.60	3.39	3.75	3.68	3.66	3.51	2.87	*		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
N=368. Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree.
*Value was not calculated due to lack of qualified items within this factor

4.7.2. Responses to Hypothetical Negative Park Changes

In order to understand the behavioral implications of residents' park attachment, participants were asked to indicate the extent to which they agree with a variety of responses that they might have and actions they might take when facing park changes regarded by them as undesirable. The mean rating and ranking of each behavioral intention item are presented in Table 4. 38.

Descriptive Statistics

Generally speaking, participants were more likely to have negative psychological responses than to become active when facing negative park changes. They may miss the park characteristics that would be changed (M=3.27), and they may try to seek alternative recreation sites (M=3.15). They may also feel kind of personal loss (M=3.06) or feel very sad (M=3.02), and may regard the changes as reduction in the quality of their life (M=3.01). Participants seemed to agree to a lesser extent that they will take concrete actions to fight against negative changes, such as complaining to authority (M=2.88), urging residents committee to take actions (M=2.82), attending community meetings to protest (M=2.74), or joining community activities (M=2.72). Participants were least likely to agree that they may stop visiting the park (M=2.71), indicating that they may keep using the park for recreation regardless of the negative changes.

One-way analysis of variance (Table 4. 38) revealed that, except for three items, there were no significant differences between neighborhoods regarding mean ratings of the behavioral intention items. It was found that Choa Chu Kang participants were significantly more likely to seek other parks as alternatives for recreation than did Woodlands participants. On the other hand, Choa Chu Kang group also showed significantly higher tendency to complain to Town Council or urge residents committee to take actions to stop the negative changes than did Woodlands group. These findings suggest that, although Choa Chu Kang participants may become more active when facing negative park changes, they may still keep an open mind to alternative recreation choices.

Table 4. 38 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Responses to Hypothetical Negative Park Changes

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Responses to Hypothetical Negative Park Changes	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
I may miss many previous characteristics of the park	3.27	1.00	1	3.34	0.91	2	3.21	1.07	1	3.27	1.00	0.464	0.629
I may try to find other parks to satisfy my recreation needs	3.12	1.05	2	3.36	1.00	1	3.00	1.06	2	3.15	1.05	3.381	0.035
I may feel some kind of personal loss	3.04	1.04	4	3.21	0.86	4	2.95	1.08	3	3.06	1.01	1.936	0.146
I may feel very sad	3.10	0.98	3	3.12	0.91	5	2.86	1.11	5	3.02	1.01	2.455	0.087
I may feel it is a reduction in the quality of my life	2.94	0.94	5	3.22	0.82	3	2.92	1.05	4	3.01	0.95	3.522	0.031
I will complain to the Town Council about the changes	2.92	1.07	6	3.10	1.02	6	2.62	1.09	8	2.88	1.08	5.771	0.003
I will urge the residents committee to take action	2.82	1.04	7	3.03	0.92	7	2.62	1.06	8	2.82	1.02	4.471	0.012
I will attend community meetings to protest the changes	2.70	0.96	10	2.90	0.91	8	2.64	1.05	6	2.74	0.98	2.195	0.113
I may join community activities to fight the changes	2.79	1.03	8	2.75	0.88	10	2.61	1.03	10	2.72	0.99	1.075	0.342
I will not visit the park any more	2.71	0.93	9	2.80	0.99	9	2.64	1.00	6	2.71	0.97	0.731	0.482

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Exploratory Factor Analysis

In order to identify the latent structure of residents' responses to hypothetical negative changes, exploratory factor analysis was performed and two factors were extracted (Table 4. 39).

The first factor was labeled "Being Active", since the four items included in this factor represented tendency to take actions to deal with hypothetical negative changes in an active way, such as "join community activities" (M=2.72, λ=0.87), "attend community meeting to protest" (M=2.74, λ=0.87), "urge residents committee to take actions" (M=2.82, λ=0.80), and "complain to the Town Council" (M=2.88, λ=0.68). This factor accounted for 31.55% of the total variance and had an acceptable alpha value of 0.88.

The second factor was named "Being Sad", as the five items included reflected the negative psychological reactions residents might have when facing negative changes, such as "feel some kind of personal loss" (M=3.06, λ=0.76), "feel very sad" (M=3.02, λ=0.75), "miss many previous characteristics of the park" (M=3.27, λ=0.60), and intentions to stop visiting the park (M=2.71, λ=0.62) or "find other parks nearby to satisfy recreation needs" (M=3.15, λ=0.54). This factor accounted for 29.0% of the total variance and its alpha value was 0.75.

The results of factor analysis are consistent with that revealed in descriptive statistics. They suggest that there may be two types of responses toward negative park changes: residents may either have negative psychological responses, such as grieving for the park, and start looking for substitutes for recreation needs, or take active part in protective activities to fight against negative changes in a active manner. In both ways, the behavioral implications of their emotional bonds to neighborhood parks are manifested.

Following exploratory factor analysis, two new summary scales of behavioral intentions, "Being Active" and "Being Sad", were constructed by computing the mean scores across items comprising respective factors for each respondent.

Table 4. 39 Exploratory Factor Analysis - Responses to Hypothetical Negative Park Changes

Responses to Hypothetical Negative Park Changes	Factor 1: Being Active	Factor 2: Being Sad	Item mean	SD
I may join community activities to fight the changes	**0.87**	0.18	2.72	0.99
I will attend community meetings to protest the changes	**0.87**	0.13	2.74	0.98
I will urge the residents committee to take action to stop the changes	**0.80**	0.35	2.82	1.02
I will complain to the Town Council about the changes	**0.68**	0.38	2.88	1.08
I may feel some kind of personal loss	0.24	**0.76**	3.06	1.01
I may feel very sad	0.23	**0.75**	3.02	1.01
I may feel it is a reduction in the quality of my life	**0.46**	**0.63**	3.01	0.95
I will not visit the park any more	0.02	**0.62**	2.71	0.97
I may miss many previous characteristics of the park	0.30	**0.60**	3.27	1.00
I may try to find other parks nearby to satisfy my recreation needs	0.33	**0.54**	3.15	1.05
Eigenvalue	4.86	1.19		
% of Variance explained	31.55	29.00		
Cumulative variance explained	31.55	60.55		
Cronbach's alpha	0.88	0.75		
Factor mean	2.79	3.04		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

N=368. Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

4.7.3. Willingness of Participation

The third part of the investigation of residents' park-related attitudes and behaviors is to explore their willingness of participation. Participants were asked to indicate the extent to which they are willing to engage in four different types of neighborhood-park-related community activities. (Table 4. 40)

Participants' responses to the four types of activities were consistent across the three neighborhoods. The mean rating of each participation item of each neighborhood was below the medium value, suggesting that respondents were not willing to participate in park-related activities. Relatively speaking, respondents were most willing to work in community gardens on a plot to grow flowers or vegetation within the park (M=2.49). To a lesser extent, they were willing to attend public meetings to work with HDB landscape designers to express their own opinions on park design (M=2.29), or join park committee and work with park staff to take care of their own park (M=2.24). Respondents were least willing to share part of the fee of park improvements based on their own suggestions (M=2.14). A summary scale of willingness of participation was constructed by calculating the mean scores across the four items for each participant.

Table 4. 40 Mean Ratings of Willingness to Participate in Park-related Activities

	Bukit Panjang Neighborhood 5 (N=146)		Choa Chu Kang Neighborhood 7 (N=103)		Woodlands Neighborhood 6 (N=119)		Total (N=368)			
Participation Item	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Sig
Willing to work in community gardens on a plot to grow our own flowers or vegetables within the neighborhood park, if there is one.	2.54	1.24	2.39	1.28	2.53	1.33	2.49	1.28	0.495	0.610
Willing to attend public meetings to work with HDB landscape designers and express my opinions on how the neighborhood park should be designed.	2.28	1.17	2.39	1.08	2.21	1.13	2.29	1.13	0.693	0.501
Willing to join park committee and work with park staff to take care of our own neighborhood park, if residents are involved in park management.	2.20	1.12	2.29	1.08	2.26	1.20	2.24	1.13	0.218	0.804
Willing to share part of the fee of park improvements that are based on our suggestions of neighborhood park upgrading, if they are accepted by HDB.	2.07	1.08	2.22	1.01	2.15	1.03	2.14	1.04	0.676	0.509
Grand Mean	2.27		2.32		2.29		2.29			
Cronbach's Alpha	0.83		0.86		0.82		0.84			

Sorted by mean ratings of "Total".

Scale: 1=Not at all, 2=Slight, 3=Moderately, 4=Very, 5=Extremely

Group Differences regarding Park-related Attitudes and Behaviors

One-way analysis of variance (Table 4. 41) revealed that significant differences exist between age groups regarding most of the park upgrade categories. Young participants aged 15 to 19 gave significantly stronger support to "create naturalistic landscapes", "add cultural contents", "facilitate active recreation", and "commercial development" than did middle-aged and senior groups, whereas the 40-49 group appeared to be more supportive on "increase human interventions" than did the 20-29 group. There were no significant differences between age groups regarding their responses to negative park changes and their willingness of participation.

Table 4. 41 ANOVA – Differences between Age Groups regarding Park-related Attitudes and Behaviors

Park-related Attitudes & Behaviors	15-19 (N=62)	20-29 (N=66)	30-39 (N=85)	40-49 (N=103)	50-59 (N=36)	>=60 (N=16)	F	Sig.
Upgrade: Create naturalistic landscapes	3.69	3.54	3.64	3.65	3.28	3.64	2.038	0.073
Upgrade: Add cultural contents	3.80	3.39	3.33	3.41	2.97	2.91	6.237	0.000
Upgrade: Increase human interventions	3.71	3.56	3.82	3.89	3.60	3.72	2.925	0.013
Upgrade: Facilitate active recreation	3.87	3.58	3.72	3.71	3.36	3.41	3.719	0.003
Upgrade: Add architectural elements	3.76	3.69	3.64	3.68	3.49	3.48	0.904	0.479
Upgrade: Add natural design elements	3.72	3.52	3.59	3.57	3.35	3.38	1.675	0.140
Upgrade: Commercial development	3.28	2.95	2.81	2.72	2.69	2.56	2.577	0.026
Response to changes: Be active	2.67	2.74	3.00	2.71	2.83	2.63	1.584	0.164
Response to changes: Be sad	2.94	3.06	3.16	3.01	3.02	3.01	0.789	0.558
Willingness of participation	2.33	2.17	2.44	2.28	2.33	1.89	1.247	0.287

No significant differences between male and female were found respondents regarding their park-related attitudinal inclinations and behavioral intentions, but generally speaking, male respondents rated relatively higher on most attitude and behavior factors than did female respondents.

In terms of differences between ethnic groups, it was also found that Malay group was more supportive for proposals that facilitate active recreation than did Chinese group, and Indian group showed significantly greater willingness to participate park-related activities than did Chinese group. No differences were found between the three ethnic groups regarding other attitude and behavior factors (Table 4. 42).

Table 4. 42 ANOVA – Differences between Ethnic Groups regarding Park-related Attitudes and Behaviors

Park-related Attitudes & Behaviors	Chinese (N=251)	Malay (N=69)	Indian (N=35)	Others (N=13)	F	Sig.
Upgrade: Create naturalistic landscapes	3.55	3.61	3.76	4.04	2.838	0.038
Upgrade: Add cultural contents	3.32	3.52	3.46	3.88	2.733	0.044
Upgrade: Increase human interventions	3.72	3.86	3.75	3.81	0.868	0.458
Upgrade: Facilitate active recreation	3.56	3.91	3.80	4.12	8.272	0.000
Upgrade: Add architectural elements	3.60	3.82	3.64	3.96	2.461	0.062
Upgrade: Add natural design elements	3.49	3.63	3.78	4.00	4.225	0.006
Upgrade: Commercial development	2.78	3.14	2.96	2.88	1.986	0.116
Response to changes: Be active	2.78	2.80	2.90	2.60	0.416	0.742
Response to changes: Be sad	3.04	3.05	3.01	3.14	0.115	0.951
Willingness of participation	2.18	2.46	2.71	2.44	4.593	0.004

With regard to differences between length of residence groups, no significant differences were found with respect to mean ratings of majority of the attitude and behavior factors except that respondents living in current flat for one to three years seemed to be more willing to participate park-related activities than did those long term respondents who had stayed in their current flats for more than nine years.

No significant differences between neighborhoods were found in terms of preference for upgrade proposals and willingness of participation, except that Woodlands group supported more strongly active recreation than did Bukit Panjang group. Choa Chu Kang group was found to be more likely to suffer psychologically from negative park changes and become active than did Woodlands group. (Table 4. 43)

Table 4. 43 ANOVA – Differences between Neighborhoods regarding Park-related Attitudes and Behaviors

Park-related Attitudes & Behaviors	Bukit Panjang Neighborhood 5 (N=146)	Choa Chu Kang Neighborhood 7 (N=103)	Woodlands Neighborhood 6 (N=119)	F	Sig.
Upgrade: Create naturalistic landscapes	3.61	3.59	3.59	0.025	0.975
Upgrade: Add cultural contents	3.34	3.38	3.46	0.717	0.489
Upgrade: Increase human interventions	3.70	3.73	3.83	1.530	0.218
Upgrade: Facilitate active recreation	3.54	3.71	3.80	5.582	0.004
Upgrade: Add architectural elements	3.62	3.69	3.68	0.350	0.705
Upgrade: Add natural design elements	3.52	3.55	3.62	0.647	0.524
Upgrade: Commercial development	2.94	2.85	2.79	0.565	0.569
Response to changes: Be active	2.81	2.94	2.62	3.874	0.022
Response to changes: Be sad	3.05	3.17	2.93	3.031	0.049
Willingness of participation	2.27	2.32	2.29	0.088	0.916

4.8. Neighborhood Attachment

It is hypothesized that residents' attachment to nearby neighborhood parks, which are important components of the physical environment of HDB new towns, may have substantial contributions to their attachment with the neighborhoods in which they live. In order to gauge residents' emotional bonds with their neighborhoods, participants were asked to indicated the extent to which they agree with nine statements which depict a wide range of relationships one may have with his/her neighborhood.

Descriptive Statistics

The rankings of the mean ratings of the neighborhood attachment items were consistent across the three neighborhoods (Table 4. 44). Generally speaking, respondents held slightly positive impressions towards their neighborhood. They felt comfortable living in their neighborhoods (M=3.81), and they also gave relatively positive evaluation to their relationships with neighbors (M=3.76). They identified with the neighborhood (M=3.65) and living here definitely endowed them with pride (M=3.60). Respondents were satisfied with their neighborhoods in terms of meeting their needs (M=3.57) as well. To them the neighborhood is like a big family (M=3.42), and moving out of the neighborhood may make them feel sad (M=3.40). To a lesser extent, though still above medium level, respondents agreed that neighborhood means a lot to them (M=3.37) and they felt deeply connected with it (M=3.30).

One-way analysis of variance (Table 4. 44) revealed that there were no significant differences between neighborhoods regarding the mean ratings of neighborhood attachment items except that Woodlands participants rated significantly higher on "feel comfortable living in this neighborhood" than did Bukit Panjang participants.

Table 4. 44 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Neighborhood Attachment Items

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Total (N=368)			
Neighborhood Attachment Items	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
I feel comfortable living in this neighborhood	3.72	0.88	1	3.77	0.67	1	3.95	0.72	1	3.81	0.78	3.056	0.048
My neighbors are all kind and helpful	3.71	0.86	2	3.76	0.76	2	3.83	0.85	2	3.76	0.83	0.761	0.468
I feel that I am definitely a part of this neighborhood	3.58	0.84	3	3.60	0.72	4	3.80	0.78	3	3.65	0.79	2.963	0.053
I am proud to be a resident of this neighborhood	3.51	0.84	4	3.60	0.70	4	3.71	0.77	4	3.60	0.79	2.304	0.101
This neighborhood can satisfy most of my needs	3.49	0.91	5	3.64	0.73	3	3.61	0.77	5	3.57	0.82	1.194	0.304
This neighborhood is like a big family to me	3.38	0.93	6	3.32	0.84	7	3.54	0.83	6	3.42	0.88	1.875	0.155
I will feel sorry if I move out this neighborhood	3.31	1.01	9	3.50	0.79	6	3.44	0.94	7	3.40	0.93	1.452	0.235
To live in this neighborhood means a lot to me	3.36	0.83	7	3.31	0.71	8	3.43	0.91	8	3.37	0.82	0.570	0.566
I feel I am deeply connected to this neighborhood	3.32	0.89	8	3.21	0.79	9	3.35	0.87	9	3.30	0.86	0.773	0.462

Sorted by mean ratings of "Total".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Exploratory Factor Analysis

Only one factor was extracted from exploratory factor analysis for the entire sample, and this was the same for the three neighborhoods (Table 4. 45). All neighborhood attachment items had relatively high loadings on the single factor, ranging from 0.64 to 0.89, and the alpha values of the factors obtained from both the entire sample and the three neighborhoods respectively were also high, ranging from 0.90 to 0.92. The mean scores of the factors were all above 3, ranging from 3.49 to 3.63, indicating that participants' attachment to the respective neighborhood was positive. Following the exploratory factor analysis, a summary scale named "Neighborhood Attachment" was constructed following factor analysis by calculating the mean score across all neighborhood attachment items for each participant. One-way analysis of variance did not reveal any significant difference between neighborhoods regarding the mean ratings of the summary neighborhood attachment scale.

Table 4. 45 Exploratory Factor Analysis - Neighborhood Attachment

	Factor Loadings					
	Bukit Panjang neighborhood 5	Choa Chu Kang neighborhood 7	Woodlands neighborhood 6	Entire sample	Item mean	
Neighborhood Attachment Items	(N=146)	(N=103)	(N=119)	(N=368)	(N=368)	SD
To live in this neighborhood means a lot to me	**0.89**	**0.83**	**0.85**	**0.86**	3.37	0.82
This neighborhood is like a big family to me	**0.83**	**0.82**	**0.81**	**0.82**	3.42	0.88
I feel I am deeply connected to this neighborhood	**0.82**	**0.79**	**0.81**	**0.81**	3.30	0.86
I feel that I am definitely a part of this neighborhood	**0.84**	**0.77**	**0.76**	**0.80**	3.65	0.79
This neighborhood can satisfy most of my needs	**0.78**	**0.75**	**0.77**	**0.77**	3.57	0.82
I feel comfortable living in this neighborhood	**0.79**	**0.68**	**0.76**	**0.76**	3.81	0.78
I will feel sorry if I move out this neighborhood	**0.79**	**0.70**	**0.74**	**0.75**	3.40	0.93
I am proud to be a resident of this neighborhood	**0.73**	**0.72**	**0.73**	**0.73**	3.60	0.79
My neighbors are all kind and helpful	**0.64**	**0.67**	**0.74**	**0.68**	3.76	0.83
Eigenvalue	5.66	5.05	5.43	5.44		
% of Variance explained	62.85	56.11	60.28	60.42		
Cronbach's alpha	0.92	0.90	0.92	0.92		
Factor mean	3.49	3.52	3.63	3.54		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree.

CHAPTER 5. HYPOTHESES EXAMINATION

This chapter presents the results of hypotheses examination. It consists of three sections. The first section examines the first hypothesis concerning the dimensional nature of place attachment, in which four different models proposed as explanations of the factorial structure of place attachment measurement were examined and compared, and the most superior model was identified. The second section examines the second hypothesis concerning the factors that may affect place attachment and the mechanism that underlying the development of place attachment. First, the direct relationships between each of the hypothesized predictive domains and place attachment were individually analyzed, followed by an examination of the effects of all the significant predictors as identified in the previous analyses in the prediction of place attachment. The purposes were to identify the significant predictors of place attachment within each hypothesized predictive domain and to confirm the prominence of identification with place meaning as the most significant predictors of place attachment. Second, the key mediating role that place meaning plays in the relationships between the hypothesized predictor variables and place attachment was examined via mediational analysis. With the help of structural equation modeling technique, this analysis aimed at identifying the indirect effects of predictor variables on place attachment that are mediated via identification with place meaning, which is theorized as the key process that leads to the development of attachment. The third section examines the last two hypotheses concerning the impacts of place attachment on place-related attitudes and behaviors and neighborhood attachment.

5.1. Examining the Dimensional Nature of Place Attachment

What is the nature of place attachment? Place attachment - a positive emotional bond developed between an individual or groups of people and a place - is the core concept explored in this study. It is hypothesized that place attachment is composed of three sub-dimensions: place dependence which refers to continuous functional reliance on place, place identity which refers to strong self-identity in reference to place, and place caring which refers to persistent concern with and commitment to place. As argued in the first chapter, neighborhood parks, due to their close relationship with residents' everyday lives, may gradually be known as specific "places" within neighborhood area, and emotional bonds may develop between residents and these nearby open spaces over time as a result of residents' continuous use and experience of the park. Thus, in this study neighborhood park is the "place" referred to in the concept of place attachment under study. This section presents the results related to participants' attachment to nearby neighborhood parks.

Descriptive Statistics

Abstract phenomena such as place attachment and sense of place cannot be observed directly but can be inferred on the basis of observable and measurable variables believed to represent them (Byrne, 2001, p. 4). In this study park attachment was measured through fifteen items, five for each of the hypothesized attachment sub-dimensions, i.e. park caring, park dependence, and park identity. Participants were asked to indicate the extent to which they agree with each of these statements using a 5-point Likert scale. The mean rating and rank of each item are shown

in Table 5. 1.

Generally speaking, the respondents' responses to the park attachment measurement items range from slightly negative to slightly positive, indicating that the respondents did not hold a very strong attachment feeling towards their respective neighborhood parks. With regard to the sample as a whole, the item, "It is important for me to know how this park may be redesigned and redeveloped by the authority in future", received the highest mean rating (M=3.49). The item, "I care about the neighborhood park very much", also received relatively high mean ratings (M=3.30), followed by "I feel this park is a part of me" (M=3.20), "I always pay particular attention to the changes happening to this park" (M=3.19), "This neighborhood park means a lot to me" (M=3.18), "This park is the best place for what I like to do" (M=3.16), and "This park is very special to me" (M=3.08). Among the above seven items which received mean ratings above 3, three belong to the hypothesized park caring dimension, three belong to park identity dimension, and one from park dependence dimension.

Participants seemed to be less likely to agree with the statement that "I would be very willing to invest may time and energy on activities related to this park" (M=2.98), "Visiting and using this park says a lot about who I am" (M=2.94), "I get more satisfaction out of visiting this park than from visiting any other parks" (M=2.90), and "I would like to know the history of this park" (M=2.89). Three items belonging to park dependence dimension, "Doing what I do in this park is more important to me than doing it in any other place" (M=2.87), "I will not find any other places to do the types of things I usually do in this neighborhood park" (M=2.78), and "To me, no other places can compare to this nearby neighborhood park" (M=2.77), received even lower mean ratings. The item, "I feel I am deeply connected with this park emotionally" received the lowest mean rating (M=2.77).

One-way analysis of variance revealed significant differences between neighborhoods regarding the mean ratings of some of the park attachment items (Table 5. 1). Woodlands participants seemed to agree to a significantly greater extent with the item "I care about the neighborhood park very much" than did Bukit Panjang and Choa Chu Kang participants. They also gave significantly higher ratings to the item "I always pay particular attention to the changes happening to this park" than Choa Chu Kang group and higher ratings to the item "This park is the best place for what I like to do" than Bukit Panjang group. These results suggest that Woodlands participants seemed to show more cares about their park than did the other two groups, and they seemed to be quite satisfied with the functionality of their park and showed less intention to substitute their park for other open spaces.

In addition, Choa Chu Kang group seemed to disagree to a significantly greater degree that "no other places can compare to this nearby neighborhood park" than did Bukit Panjang and Woodlands groups, suggesting that Choa Chu Kang participants were less likely to rely solely on their park for recreation than Bukit Panjang and Woodlands participants.

Table 5. 1 ANOVA – Differences between Neighborhoods regarding Mean Ratings of Park Attachment Items

	Bukit Panjang Neighborhood 5 (N=146)			Choa Chu Kang Neighborhood 7 (N=103)			Woodlands Neighborhood 6 (N=119)			Entire sample (N=368)			
Park Attachment Item	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	F	Sig
It is important for me to know how this park may be redesigned and redeveloped by the authority in future.	3.58	0.93	1	3.34	0.91	1	3.50	1.06	2	3.49	0.97	1.815	0.164
I care about the neighborhood park very much.	3.23	0.87	3	3.12	0.83	2	3.55	0.93	1	3.30	0.89	7.439	0.001
I feel this park is a part of me.	3.16	0.95	5	3.11	0.84	3	3.34	0.89	3	3.20	0.90	2.033	0.132
I always pay particular attentions to the changes happening to this park.	3.24	0.95	2	2.96	1.00	7	3.32	1.06	5	3.19	1.01	3.879	0.022
This neighborhood park means a lot to me.	3.21	1.02	4	3.03	0.88	5	3.27	1.02	6	3.18	0.99	1.779	0.170
This park is the best place for what I like to do.	3.05	0.92	7	3.09	0.99	4	3.34	0.97	3	3.16	0.96	3.407	0.034
This park is very special to me.	3.14	0.98	6	2.89	0.91	8	3.15	1.01	7	3.08	0.97	2.547	0.080
I would be very willing to invest my time and energy on activities related to this park.	3.01	0.93	9	2.98	0.93	6	2.95	1.02	11	2.98	0.96	0.147	0.863
Visiting and using this park says a lot about who I am.	2.97	0.98	10	2.85	0.95	9	2.97	0.87	9	2.94	0.94	0.566	0.568
I get more satisfaction out of visiting this park than from visiting any other parks.	2.90	0.94	12	2.79	0.91	11	3.02	1.01	8	2.90	0.96	1.606	0.202
I would like to know the history of this park.	3.04	1.06	8	2.84	1.01	10	2.74	1.14	15	2.89	1.08	2.723	0.067
Doing what I do in this park is more important to me than doing it in any other place.	2.93	0.96	11	2.70	0.94	13	2.93	0.97	12	2.87	0.96	2.198	0.112
I will not find any other places to do the types of things I usually do in this neighborhood park.	2.82	0.95	14	2.72	0.83	12	2.79	0.93	14	2.78	0.91	0.351	0.704
To me, no other places can compare to this nearby neighborhood park.	2.82	1.09	14	2.50	0.95	15	2.96	1.04	10	2.77	1.05	5.710	0.004
I feel I am deeply connected with this park emotionally.	2.84	0.96	13	2.62	0.90	14	2.81	0.93	13	2.77	0.94	1.837	0.161

Items sorted according to the mean ratings of "Entire sample".

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Confirmatory Factor Analysis

In order to understand the phenomenon of place attachment, we need to know the dimensional nature of this construct. First, we need to examine whether park attachment is composed of the three hypothesized dimensions that emphasize a strong self-identity in reference to park, a continuous functional reliance on park, and a persistent concern about and commitment to park, respectively. Second, we need to examine how well the hypothesized items do a good job in measuring the proposed dimensions. This section reports the results of the analyses aiming at addressing the above issues.

- Measurement Models of Park Attachment

Regarding the structure of place attachment, some theorized place attachment as a unidimensional concept (Cuba & Hummon, 1993; Hay, 1998b; McAndrew, 1998; Stedman, 2002), whereas others contended, with the support of empirical evidence, that it is better to treated place-related concept as multidimensional since its subdimensions may have different influences on other constructs (Bricker & Kerstetter, 2000; Hammitt, et al., 2006; Harris, et al., 1996; Kyle, Graefe, et al., 2003; Kyle, Graefe, Manning, et al., 2004b; Kyle, Mowen, et al., 2004; Lalli, 1992; Moore & Graefe, 1994; Ringel & Finkelstein, 1991; Williams, et al., 1992). Moreover, researchers have argued that alternative models should be proposed and compared in testing *a priori* theoretical model (Breckler, 1990; MacCallum, Wegener, Uchino, & Fabriger, 1993; Mulaik, et al., 1989). Accordingly, four measurement models were proposed as potentially feasible alternative interpretations of the structure of park attachment based on review of the theorizations of place attachment discussed in past research.

1) The first model is called Bi-Factor Model (Figure 5. 1). This model is composed of a general factor, which in this case is the general place attachment construct, and three correlated group factors, namely the hypothesized place caring, place dependence, and place identity dimensions. The general factor and the three group factors are independent to each other. This means that the three group factors – place caring, place dependence, and place identity - are not subordinate to and thus owe no explanations to the general place attachment construct. Although there are overlaps in terms of measurement items, the place general attachment construct obviously accounts for a wider range of item variances than do the three group factors.

2) The second model is called Group-Factor Model (Figure 5. 2). In this model, the three hypothesized place attachment dimensions were depicted as distinct however correlated constructs. Each of the fifteen measurement variables is expected to load on only one of the three factors that it is hypothesized to indicate.

3) The third model is called Second-Order Factor Model (Figure 5. 3). This model assumes that the variations of three hypothesized factors are accounted for by a second-order factor. In other words, the variations of the three dimensions – place caring, place dependence, and place identity - are assumed to be explained fully by their regression on a higher order factor which in this case, is the general place attachment construct.

4) The fourth model is called One-Factor Model (Figure 5. 4). In this model, all the fifteen items

are allowed to load freely on one factor, place attachment. This means that place attachment is treated as a unidimensional concept and it is measured by the fifteen items which, though related to the concept domain of place caring, place dependence, and place identity, do not differentiate from each other in a direct manner.

According to Rindskopf and Rose (1988, p. 56), these models are nested in that each model is a special case of the previous model because more restrictions on parameters are imposed on the current one compared to the previous one. Therefore, in the current case, the Bi-Factor Model is the least-restricted model, and the One-Factor Model the most-restricted.

Confirmatory factor analysis[29] was conducted separately for each model using the entire sample to examine their factorial validity - the extent to which these hypothesized factorial structures of place attachment fit to the data collected. The purpose is to identify the most superior model of park attachment with reliable construct validity through comparing these nested models.

- Criteria of Goodness-of-fit Indexes

A series of goodness-of-fit indexes were used in combination to identify the most suitable model through comparison.

Chi-square (χ^2) value and associated number of degree of freedom (df) are widely used statistical tests of significance in judging the fit of the theoretical model. However, some have pointed out that chi-square statistic, which in essence represents the likelihood ratio test, has limitations due to its sensitivity to sample size and its unrealistic assumption of a perfect model fit and thus is not such a reliable indicator of model fit (Byrne, 2001, p. 81).

Researcher thus recommended a variety of other goodness-of-fit indexes developed through more pragmatic approaches to model evaluation process. In this study, GFI, CFI, NFI, RMSEA, and SRMR values were adopted as the absolute fit indexes, in this study. whereas ACI and ECVI indexes were used for model comparison,.

According to Byrne (2001, p. 82), the GFI (Goodness-of-Fit Index) is a measure of the relative amount of variance and covariance in S (sample covariance matrix of observed variable scores) that is jointly explained by Σ (population covariance matrix). A GFI value of at least 0.90 or greater is required to accept a model.

The CFI (Comparative Fit Index) is a revision of the NFI (Normed Fit Index) that takes sample size into account (Bentler, 1990). Both of them are indicators of the extent to which the hypothesized model fits better than a baseline independent model, and a value of 0.90 or greater indicates acceptable fit.

The RMSEA (Root Mean Square Error of Approximation) is widely acknowledged as one of the most informative goodness-of-fit index (Byrne, 2001; Steiger & Lind, 1980). It takes into account

[29] Please refer to Appendix F for the correlation matrix for the mean ratings of the fifteen park attachment measurement items.

the error of approximation in the population and degrees of freedom, and measures the discrepancy between S (sample covariance matrix of observed variable scores) and Σ (population covariance matrix). A RMSEA value less than 0.05 indicates good fit; value between 0.05 and 0.08 represents reasonable and acceptable fit; value ranging from 0.08 to 0.10 represents mediocre fit, and value greater than 0.10 indicates poor fit of model to the data (Browne & Cudeck, 1993; Byrne, 2001; MacCallum, Browne, & Sugawara, 1996).

The Standardized RMR (Standardized Root Mean-square Residual) represents the average value across all standardized residual values derived from the discrepancy between the sample observed and hypothesized correlation matrices. A SRMR value of 0.05 or less represents good fit (Hu & Bentler, 1995).

The AIC (Akaike's (1987) Information Criterion) and ECVI (Expected Cross-Validation Index) are used to compare two or more models. The AIC reflects the extent to which parameter estimates from the original sample will cross-validate in future samples (Bandalos, 1993), whereas the ECVI is expected to assess, in a single sample, the likelihood that the model cross-validates across similar-sized samples from the same population (Browne & Cudeck, 1989). To both AIC and ECVI indexes smaller value represents better fit of the hypothesized model (Browne & Cudeck, 1989; Hu & Bentler, 1995).

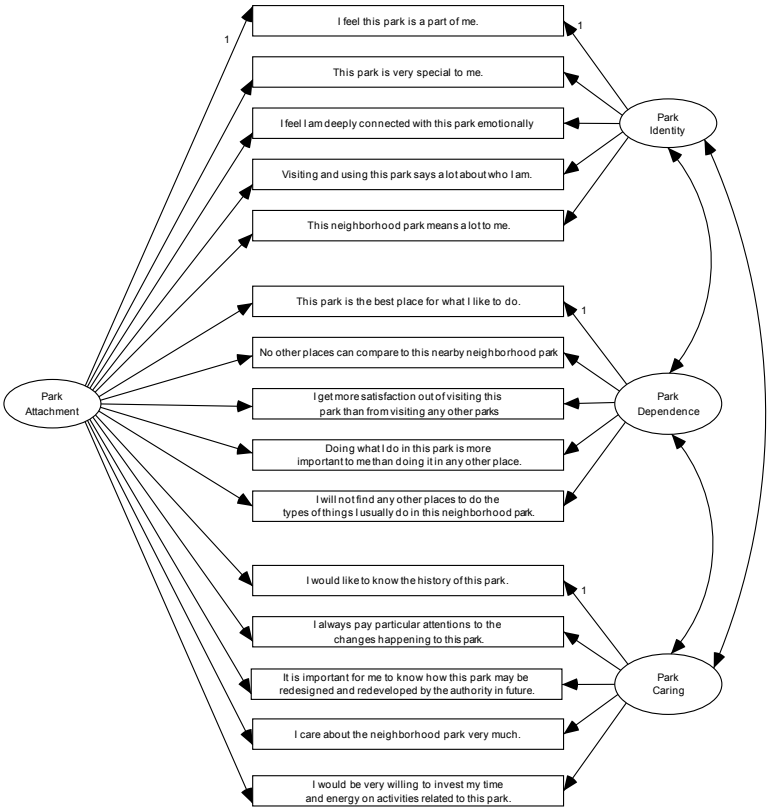


Figure 5. 1 Original Measurement Model of Park Attachment: Bi-Factor Model

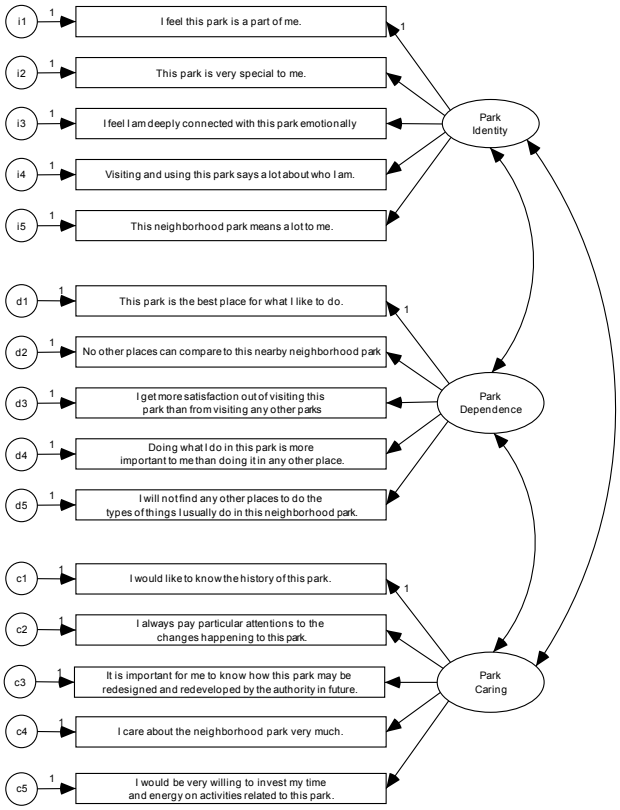


Figure 5. 2 Original Measurement Model of Park Attachment: Group-Factor Model

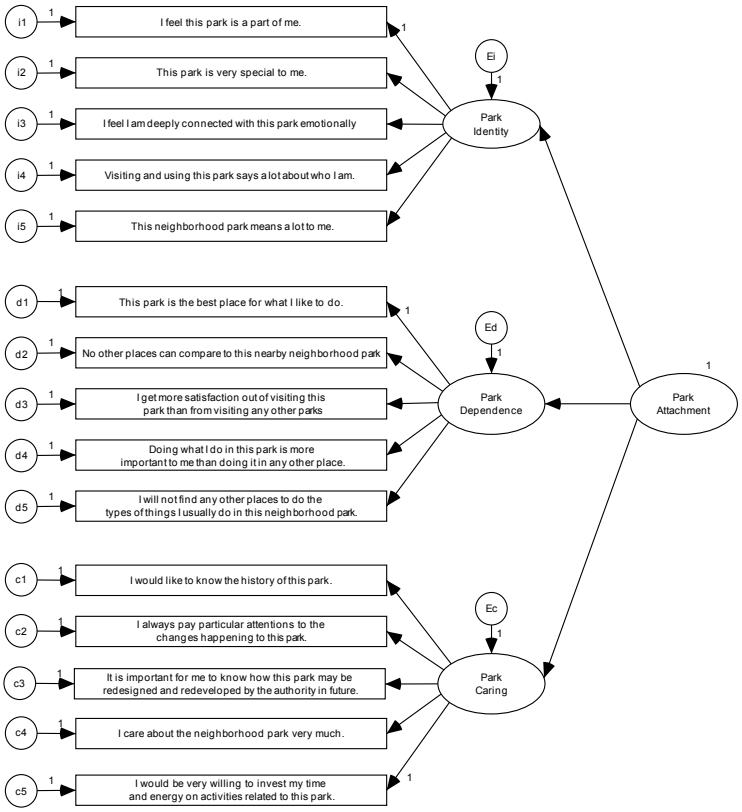


Figure 5. 3 Original Measurement Model of Park Attachment: Second-Order Factor Model

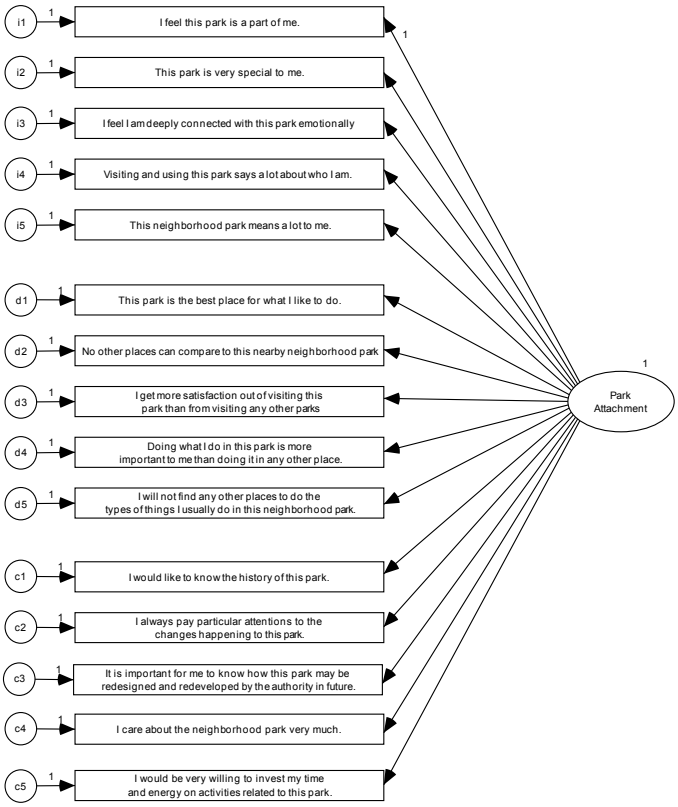


Figure 5. 4 Original Measurement Model of Park Attachment: One-Factor Model

- **Results**

The four nested measurement models of park attachment were examined in AMOS 6.0 (Arbuckle, 2006) using maximum likelihood method for estimation because this method has been shown to be one of the most robust methods available for confirmatory factor analysis and tends to be relatively robust with regard to violations of the normality assumption (Boomsma, 1982; Hau & Marsh, 2004). The overall goodness-of-fit index of each model are reported in Table 5. 2.

The Bi-Factor model (Figure 5. 5) showed good fit to the data ($\Delta\chi^2_{(72)}$=224.893, GFI=0.922, CFI=0.942, NFI=0.918, RMSEA=0.076, SRMR=0.0405), whereas the rest three models did not receive acceptable goodness-of-fit indexes in terms of the GFI, NFI, and RMSEA values specifically (Figure 5. 6, Figure 5. 8, Figure 5. 12).

It was also found that the Group-Factor model (Figure 5. 6) and the Second-Order Factor model (Figure 5. 8) have identical fit indexes. This is because that the Second-Order model contains only three first-order factors and thus it is empirically just-identified. Therefore, the chi-square value and degrees of freedom of the Second-Order model are equal to that of the Group-Factor model (Rindskopf & Rose, 1988, p. 56). In order to make the Second-Order model over-identified, some have suggested that additional assumptions about this model must be proposed or additional constrains must be imposed on it (Bollen, 1989). Close examination of the report of AMOS analysis of the Second-Order model revealed that the error variance of the Park Identity factor was negative (Ei=-0.044). Thus, the initial Second-Order model was modified by constraining this negative error variance to zero (Rindskopf & Rose, 1988, p. 59). However, the fit indexes of this constrained Second-Order model (Figure 5. 10) were still not satisfying.

Following the initial analyses, post hoc examinations were carried out by referring to the modification indexes reported in the AMOS output for each model in an attempt to re-specify the poor fit models for further tests.

As to the Group-Factor model, the following measurement item errors were allowed to covary: i1 and i2, d1 and d5, c1 and c4, and c2 and c3, based on the fact that each of these item pairs were associated with the same factor it is expected to measure. The modified Group-Factor model (Figure 5. 7) exhibited acceptable goodness-of-fit indexes ($\chi^2_{(83)}$=270.488, GFI=0.910, CFI=0.929, NFI=0.901, RMSEA=0.078, SRMR=0.0442), and the difference in Chi-square value between the initial and the modified model was significant ($\Delta\chi^2$=41.834, Δdf=4, $p<0.05$), indicating that the modified model has achieved significant improvement.

As to the constrained Second-Order model, three pairs of error terms were allowed to covary: d1 and d5, c1 and c4, c2 and c3, considering each pair was associated with the same construct. This modified constrained Second-Factor model (Figure 5. 11) received goodness-of-fit indexes ($\chi^2_{(85)}$=284.898, GFI=0.904, CFI=0.924, NFI=0.896, RMSEA=0.080, SRMR=0.0452) which were just acceptable, and the difference in Chi-square value between the initial and the modified model was significant ($\Delta\chi^2$=36.739, Δdf=3, $p<0.05$), indicating that the modified model has been improved significantly.

As to the One-Factor model, six pairs of error terms were allowed to covary: i1 and d1, i1and c4, i1 and d5, i2 and d4, i5 and c4, c2 and c3. These covariance paths were added because they were associated with the highest five modification indexes. Since the measurement variables in this model were not grouped into sub-categories, covariances between error terms which are associated with different dimensions in the contexts of the other models were allowed. This modified One-Factor model (Figure 5. 13) received acceptable goodness-of-fit indexes ($\chi^2_{(85)}$=275.049, GFI=0.910, CFI=0.928, RMSEA=0.078) with some exceptions (NFI=0.0899, SRMR=0.1108), and the difference in Chi-square value between the initial and the modified model was significant ($\Delta\chi^2$=161.533, Δdf=6, $p<0.05$), indicating that the modified model has achieved significant improvement.

Since the NFI (0.899), SRMR (0.1108), RMR (0.258) values of the modified One-Factor model were not acceptable, it was considered as a relatively poor fit model and was excluded from further analysis. In addition, since the NFI (0.896) value of the modified constrained Second-Order model was not acceptable and the rest goodness-of-fit indexes of the modified constrained Second-Order model were all lower than the Bi-Factor model and the modified Group-Factor model, the modified constrained Second-Order model was also not accepted. Finally, although the goodness-of-fit indexes of both the Bi-Factor model and the modified Group-Factor model were acceptable, the former was less restricted than the latter. Therefore, it was concluded that the modified Group-Factor model is the relatively most superior one among the four modified nested models examined and it was retained for further analysis.

Thus, the results of the confirmatory factor analysis provide substantial support for research hypothesis 1 that place attachment is a multidimensional concept and it is composed of three sub-dimensions, place dependence, place identity, and place caring, which emphasize a continuous functional reliance on place, a strong self-identity in reference to place, and a persistent concern about and commitment to place, respectively.

It is acknowledged that there appears to be strong correlations between the three factors in the chosen model of place attachment. This indicates that there might be substantial overlap between the items used to measure each of the factors. However, considering the explorative nature of this study, it is decided to maintain this model as the base for further exploration and keep these correlations in later analyses.

Following the confirmatory factor analyses, three new summary scales were constructed for the park caring, park dependence and park identity dimensions, respectively, by computing the mean score across all items comprising each dimension. All three new scales had acceptable internal item consistency ($Alpha_{Identity}$=0.84; $Alpha_{Dependence}$=0.83; $Alpha_{Caring}$=0.77).

Table 5. 2 Goodness-of-fit indexes of the nested measurement models of park attachment

							Absolute Fit Indexes							Comparative Fit Indexes	
	Measurement model of place attachment	χ^2	df	χ^2/ df	$\Delta\chi^2$	Δdf	GFI	CFI	NFI	IFI	TLI	RMSEA (90% CI)	SRMR	AIC	ECVI
[O]	Bi-Factor Model	224.893	72	3.124			0.922	0.942	0.918	.943	.915	0.076 (0.065; 0.087)	0.0405	320.893	0.874
[O]	Group-Factor Model	312.322	87	3.590			0.894	0.914	0.886	.915	.896	0.084 (0.074; 0.094)	0.0483	378.322	1.031
[M]	Group-Factor Model	270.488	83	3.259	41.834*	4	0.910	0.929	0.901	.929	.910	0.078 (0.068; 0.089)	0.0442	344.488	0.939
[O]	Second-Order Factor Model	312.322	87	3.590			0.894	0.914	0.886	.915	.896	0.084 (0.074; 0.094)	0.0483	378.322	1.031
[M]	Second-Order Factor Model	270.488	83	3.259	41.834*	4	0.910	0.929	0.901	.929	.910	0.078 (0.068; 0.089)	0.0442	344.488	0.939
[O]	Second-Order Factor Model (constrained)	321.637	88	3.655			0.892	0.911	0.882	.912	.894	0.085 (0.075; 0.095)	0.0489	385.637	1.051
[M]	Second-Order Factor Model (constrained)	284.898	85	3.352	36.739*	3	0.904	0.924	0.896	.924	.906	0.080 (0.070; 0.090)	0.0452	354.898	0.967
[O]	One-Factor Model	436.571	91	4.794			0.855	0.868	0.840	.869	.848	0.102 (0.092; 0.111)	0.1113	494.571	1.348
[M]	One-Factor Model	275.049	85	3.236	161.533*	6	0.910	0.928	0.899	.928	.911	0.078 (0.068; 0.088)	0.1108	345.049	0.940

[O]: Original model; [M]: Modified model

χ^2/ df: Ration of Chi-square to degrees of freedom. Values between 2-5 indicate acceptable fit (Klem, 2000).

$\Delta\chi^2$: difference in χ^2 values between models; Δdf: difference in number of degrees of freedom between models.

*Difference between Chi-square values of the original and the modified model is significant at the 0.05 level

GFI (Goodness-of-Fit Index): Values $\geq$ 0.9 indicate acceptable fit (Byrne, 2001).

CFI (Comparative Fit Index) and NFI (Normed Fit Index): Values $\geq$ 0.9 indicate acceptable fit (Bentler, 1990).

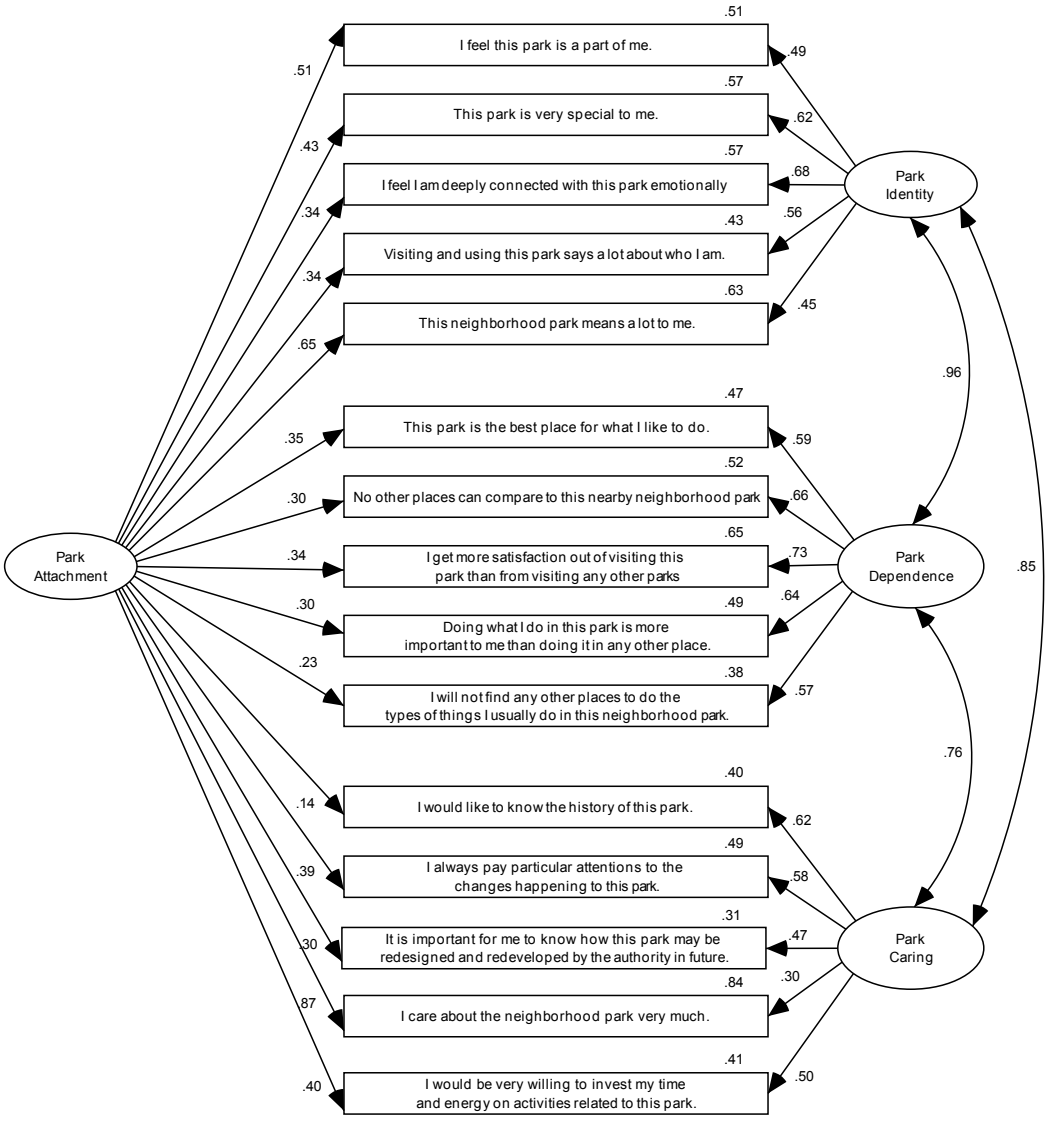
IFI (Incremental Fit Index): Values $\geq$ 0.9 indicate acceptable fit (Byrne, 2001).

TLI (Tucker-Lewis index): Values $\geq$ 0.9 indicate acceptable fit (Hu & Bentler, 1995).

RMSEA (root mean square error of approximation): Values $\leq$ 0.08 indicate acceptable fit (Steiger & Lind, 1980)

SRMR (Standardized Root Mean-square Residual): Values $\leq$ 0.05 indicate acceptable fit (Hu & Bentler, 1995).

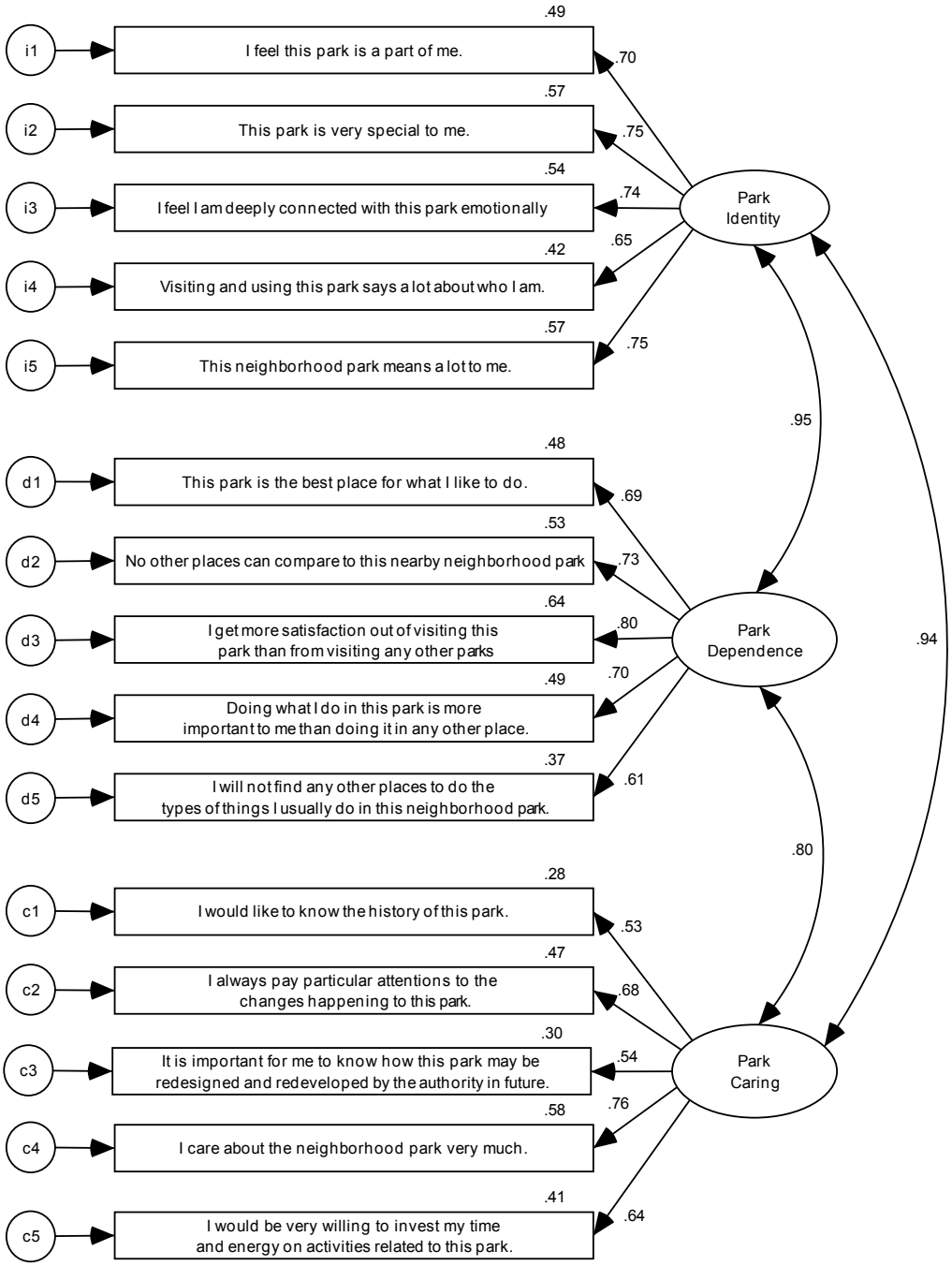
AIC (Akaike's Information Criterion) and ECVI (Expected Cross-Validation Index): A lower value indicates better fit (Akaike, 1987; Browne & Cudeck, 1989; Hu & Bentler, 1995).



Goodness-of-fit Indexes:

Chi-square= 224.893; df= 72; Chi-square/df= 3.124;
RMSEA= .076; RMR= .037; GFI= .922; CFI= .942; NFI= .918; IFI= .943; TLI= .915;
AIC= 320.893; ECVI= .874

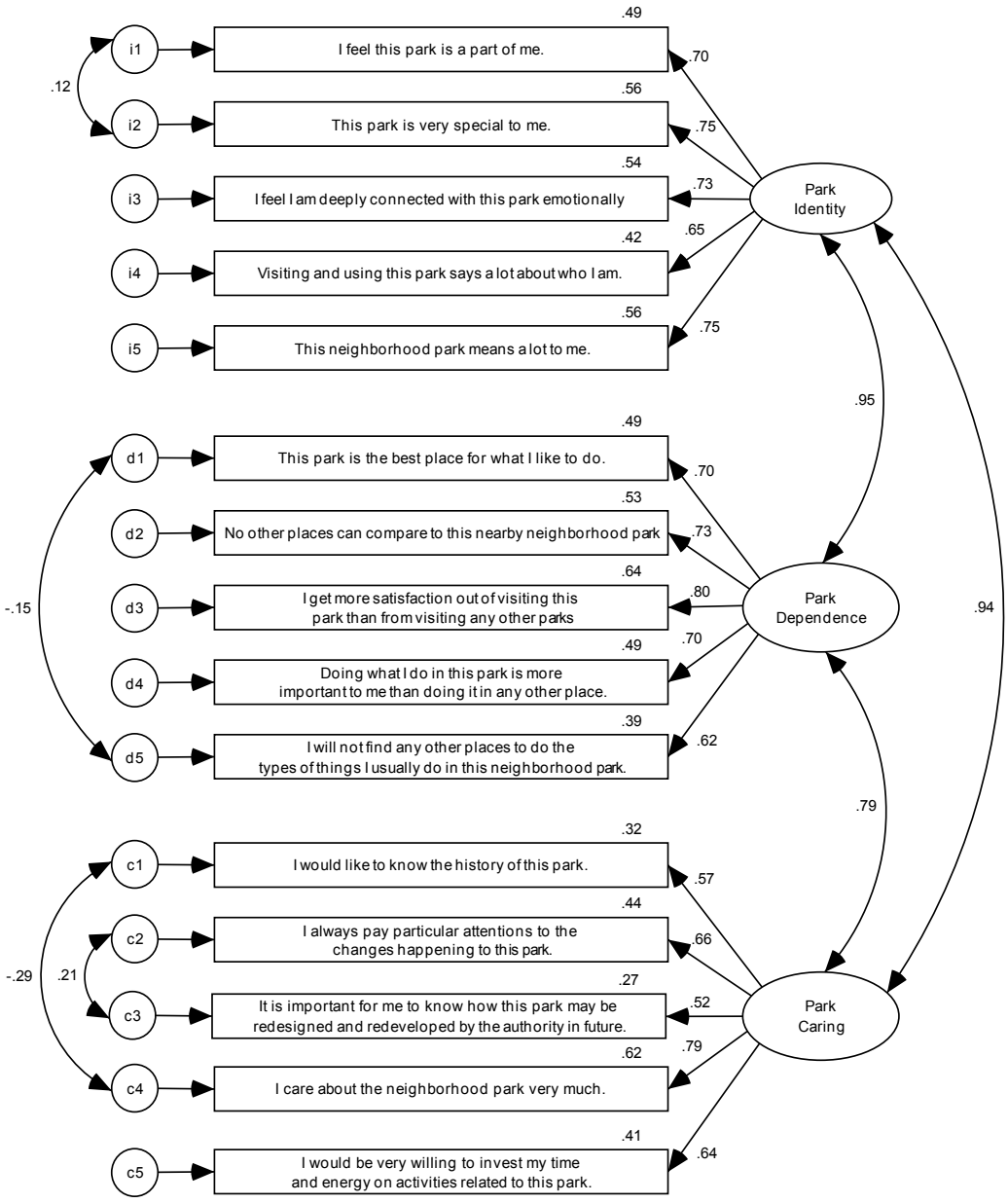
Figure 5. 5 Parameter estimations of the Bi-Factor Model



Goodness-of-fit Indexes:

Chi-square= 312.322; df= 87; Chi-square/df= 3.590;
RMSEA= .084; RMR= .044; GFI= .894; CFI= .914; NFI= .886; IFI= .915; TLI= .896;
AIC= 378.322; ECVI= 1.031

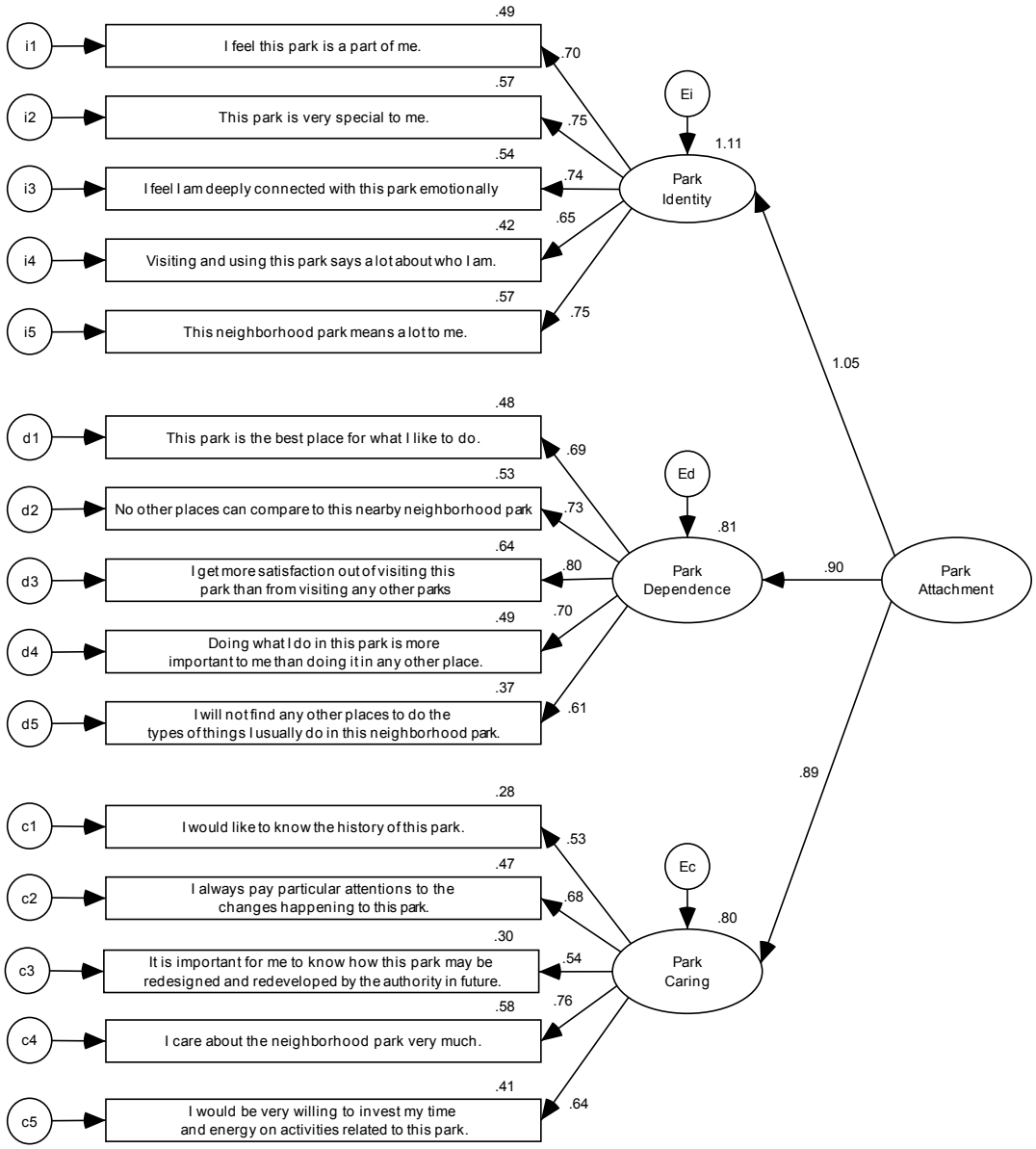
Figure 5. 6 Parameter estimations of the original Group-Factor Model



Goodness-of-fit Indexes:

Chi-square= 270.488; df= 83; Chi-square/df= 3.259;
RMSEA= .078; RMR= .041; GFI= .910; CFI= .929; NFI= .901; IFI= .929; TLI= .910;
AIC= 344.488; ECVI= .939

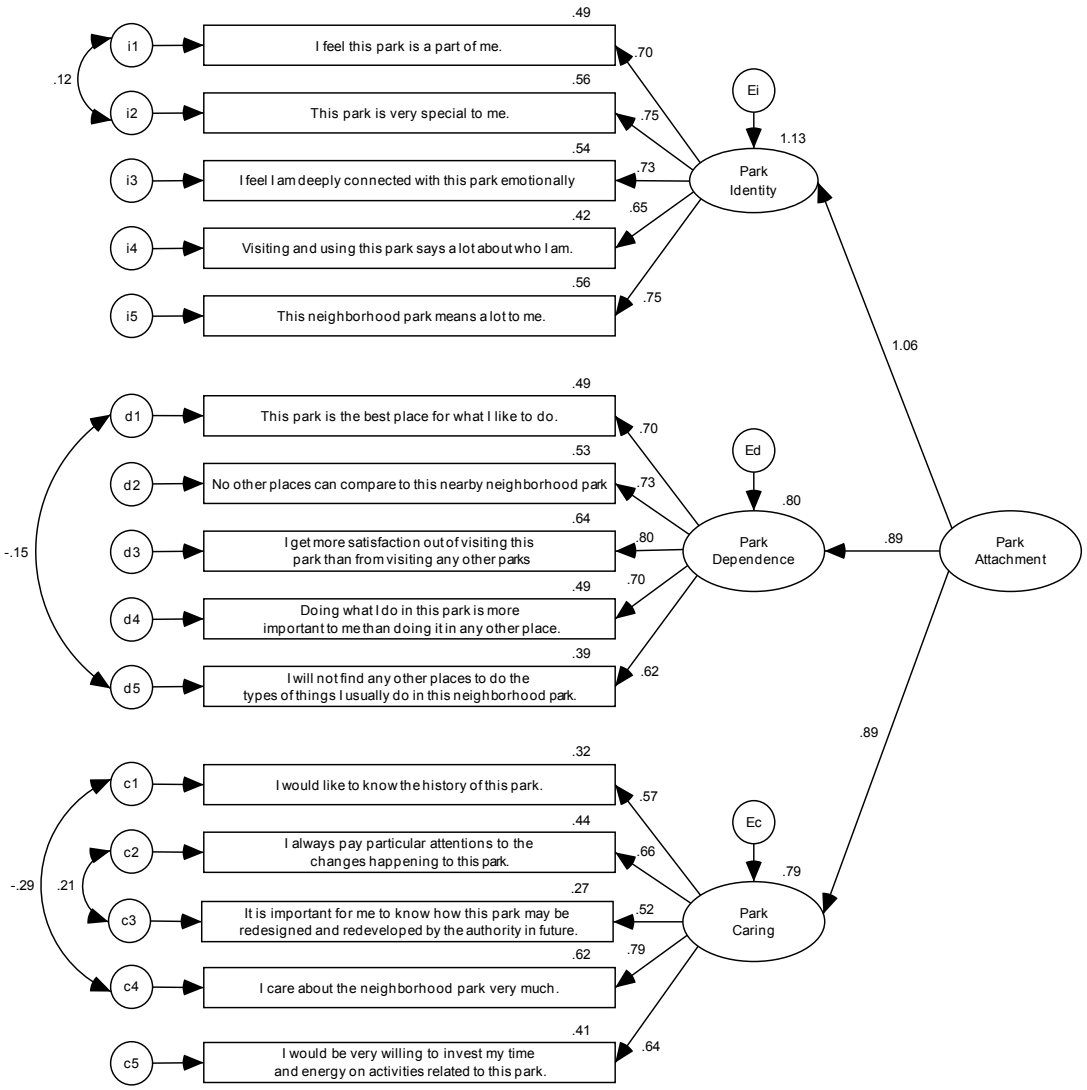
Figure 5. 7 Parameter estimations of the modified Group-Factor Model



Goodness-of-fit Indexes:

Chi-square= 312.322; df= 87; Chi-square/df= 3.590;
RMSEA= .084; RMR= .044; GFI= .894; CFI= .914; NFI= .886; IFI= .915; TLI= .896;
AIC= 378.322; ECVI= 1.031

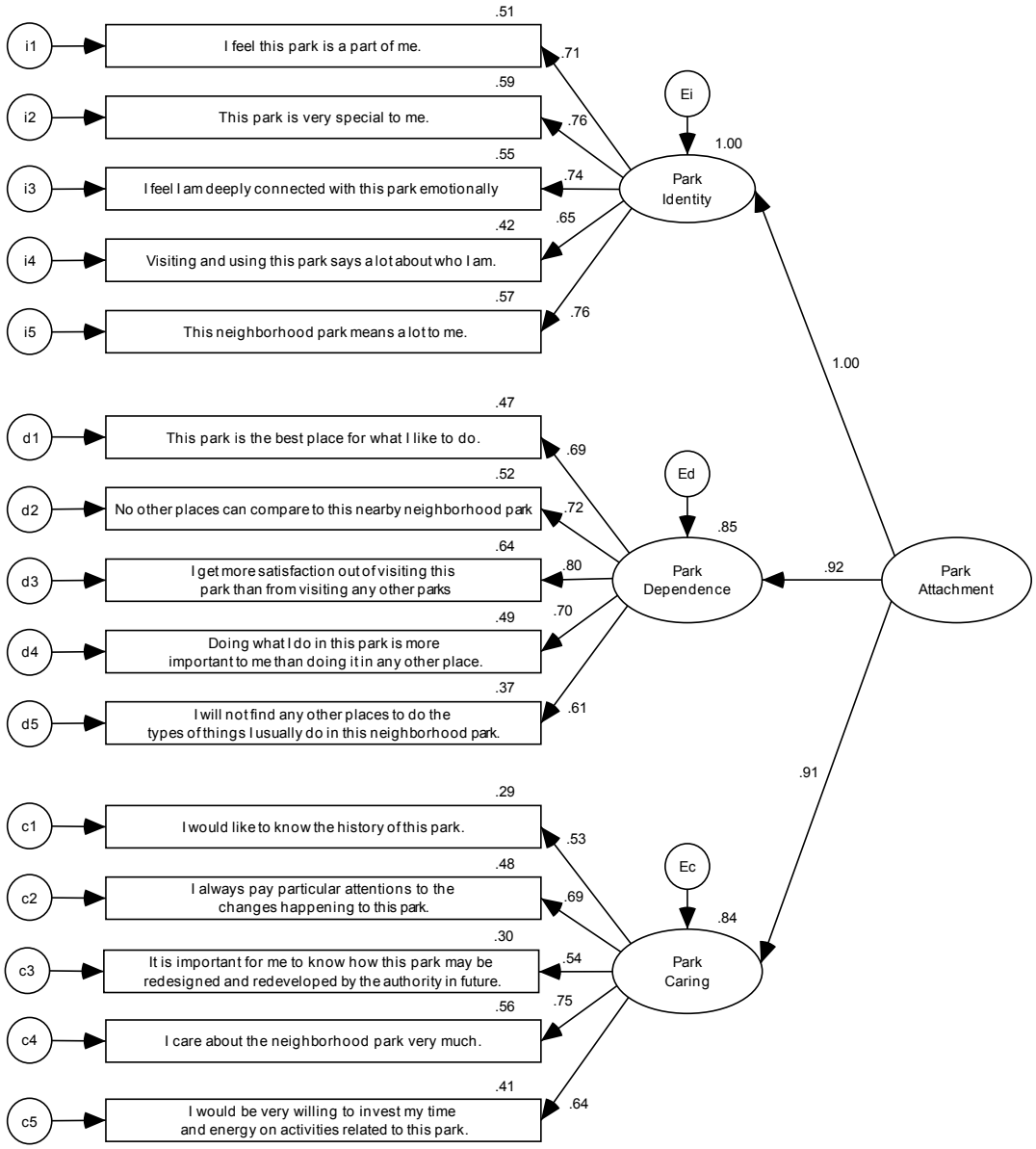
Figure 5. 8 Parameter estimations of the original Second-Order Factor Model (no constraint imposed)



Goodness-of-fit Indexes:

Chi-square= 270.488; df= 83; Chi-square/df= 3.259;
RMSEA= .078; RMR= .041; GFI= .910; CFI= .929; NFI= .901; IFI= .929; TLI= .910;
AIC= 344.488; ECVI= .939

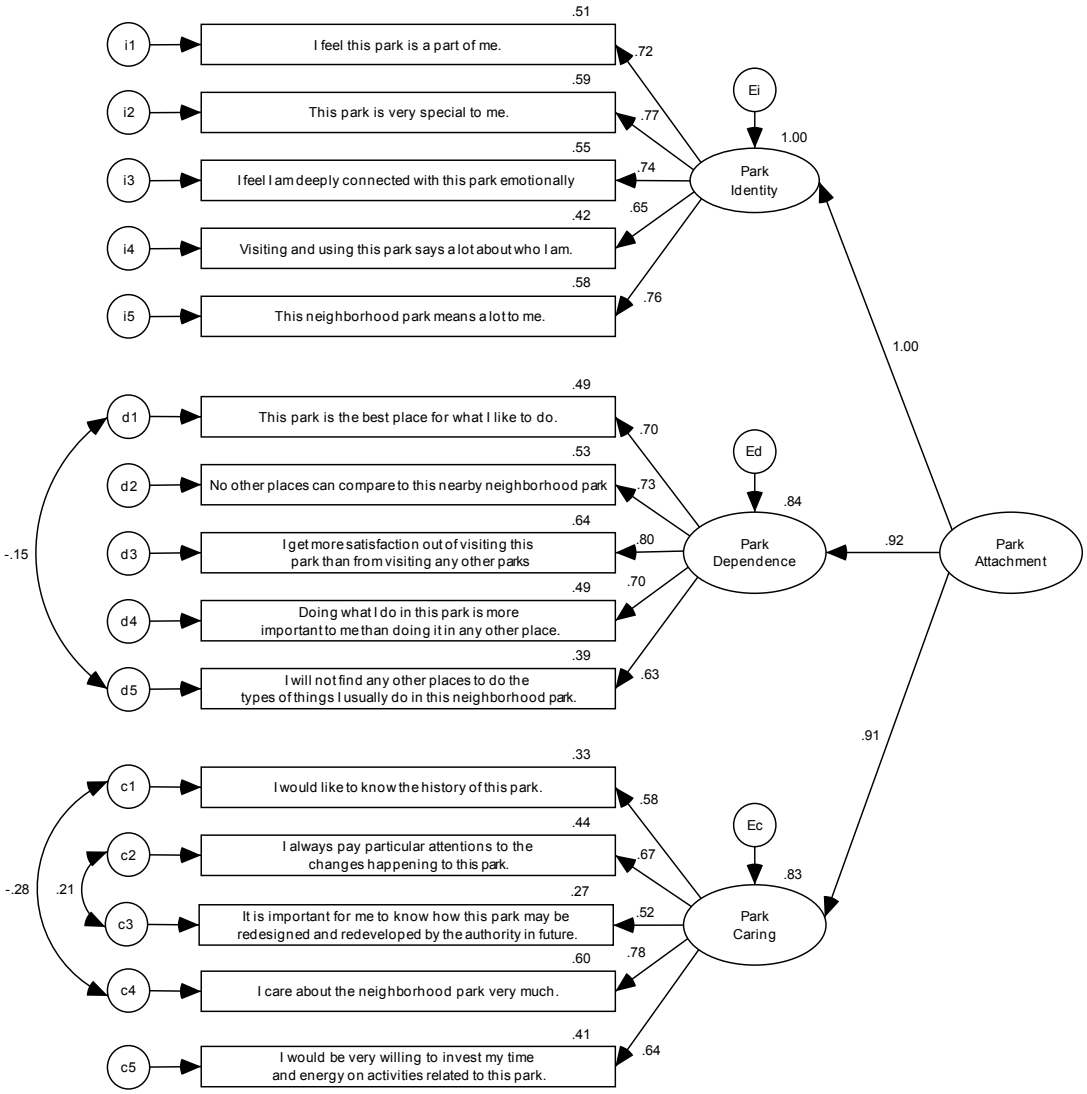
Figure 5. 9 Parameter estimations of the modified Second-Order Factor Model (no constraint imposed)



Goodness-of-fit Indexes:

Chi-square= 321.637; df= 88; Chi-square/df= 3.655;
RMSEA= .085; RMR= .045; GFI= .892; CFI= .911; NFI= .882; IFI= .912; TLI= .894;
AIC= 385.637; ECVI= 1.051

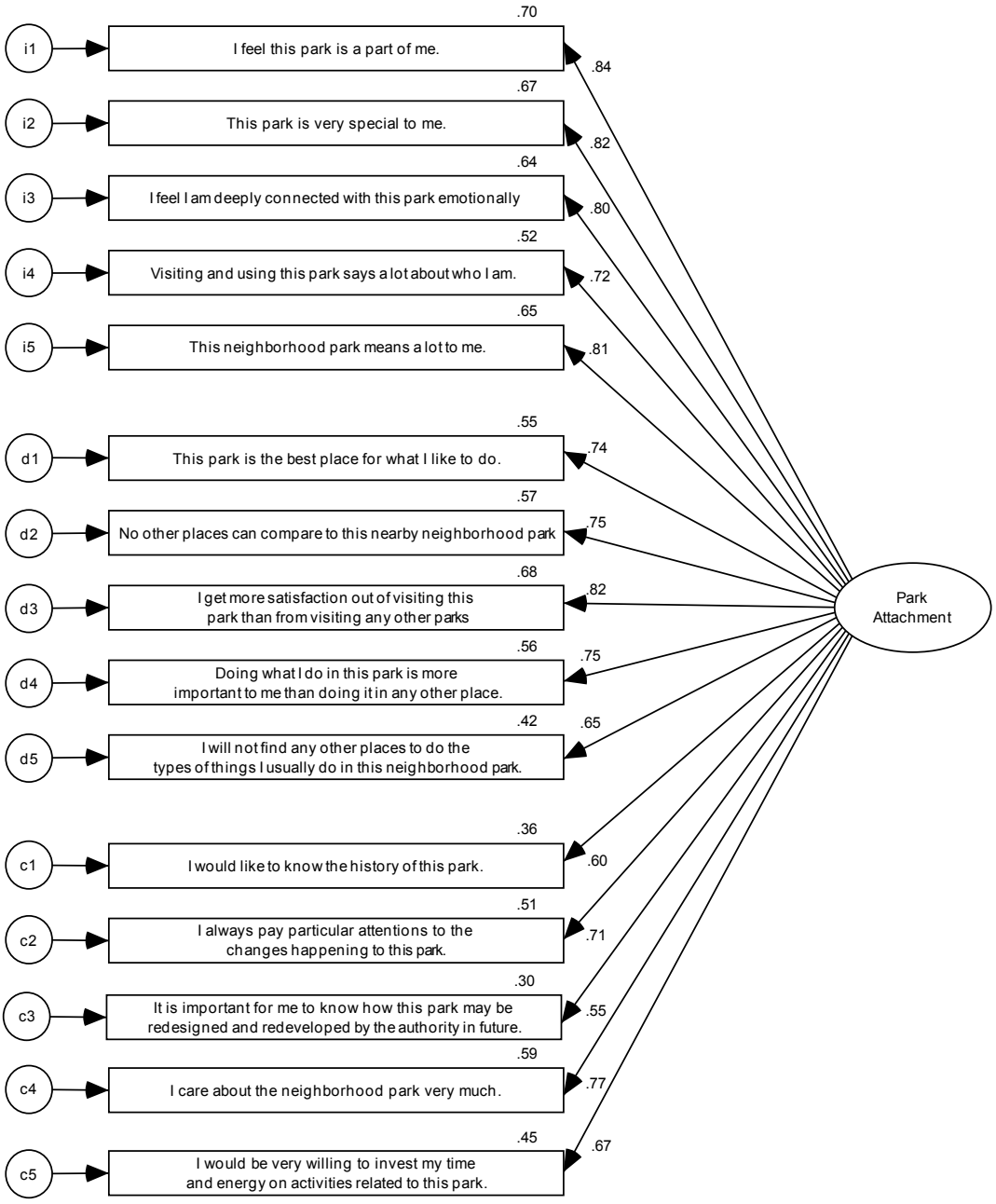
Figure 5. 10 Parameter estimations of the original Second-Order Factor Model (constrain imposed)



Goodness-of-fit Indexes:

Chi-square= 284.898; df= 85; Chi-square/df= 3.352;
RMSEA= .080; RMR= .041; GFI= .904; CFI= .924; NFI= .896; IFI= .924; TLI= .906;
AIC= 354.898; ECVI= .967

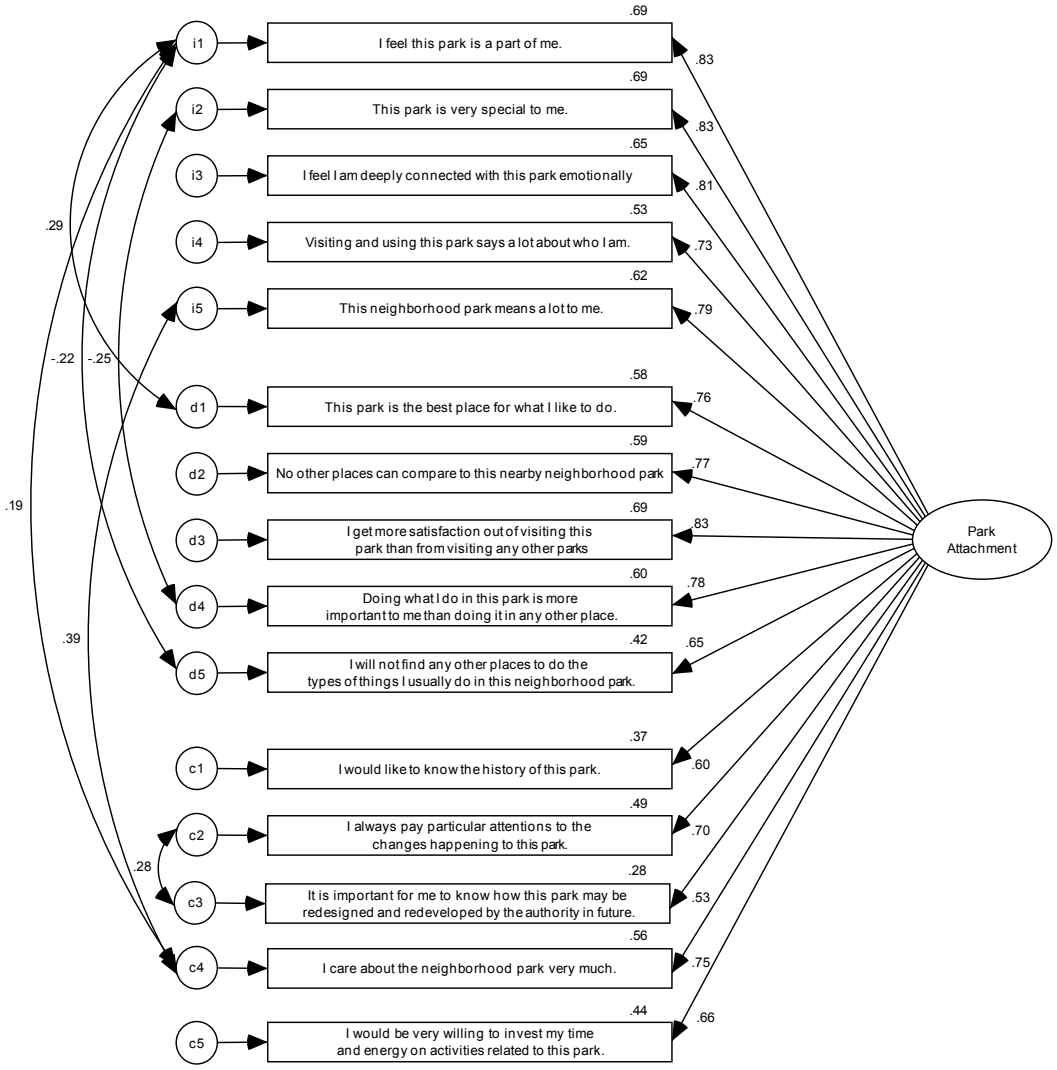
Figure 5. 11 Parameter estimations of the modified Second-Order Factor Model (constrain imposed)



Goodness-of-fit Indexes:

Chi-square= 436.571; df= 91; Chi-square/df= 4.797;
RMSEA= .102; RMR= .243; GFI= .855; CFI= .868; NFI= .840; IFI= .869; TLI= .848;
AIC= 494.571; ECVI= 1.348

Figure 5. 12 Parameter estimations of the original One-Factor Model



Goodness-of-fit Indexes:

Chi-square= 275.049; df= 85; Chi-square/df= 3.236;
RMSEA= .078; RMR= .258; GFI= .910; CFI= .928; NFI= .899; IFI= .928; TLI= .911;
AIC= 345.049; ECVI= .940

Figure 5. 13 Parameter estimations of the modified One-Factor Model

Invariance Tests

Following the confirmatory factor analysis described above, invariance tests were conducted to further assess whether the identified measurement model of place attachment could be generalized across the subgroups of the entire sample. Therefore, the entire sample was split into two groups of equal number of members and respondents were randomly assigned into one of the two groups. The modified Group-Factor model, which was identified in the confirmatory factor analysis as the most superior model of place attachment, was chosen as the baseline model.

In accordance with the procedures suggested for invariance tests (Byrne, 2001; Byrne & Shavelson, 1987; Marsh, 1994), a hierarchy of models were generated in AMOS 6.0 through

multi-group analysis, in which sets of parameters were put to equivalence test in a logically ordered and increasingly restrictive manner. The first model was the totally non-invariant model, which primarily concerns whether the structure or the form of the baseline model – the pattern of fixed and non-fixed parameters – is invariant across the two groups. This model was the least restrictive in that no between-group invariance constraints were imposed on estimated parameters, and it was also the most important in that validation of this model will provide a basis of comparison for all subsequent models in the invariance hierarchy (Marsh, 1994). Given the good fit of the first model was established, the second model, in which the factor loadings were held constant across groups, tested the hypothesis concerning the equality of factor loadings, or the similarity in the pattern of factor loadings across groups. The third model, in which the factor variances and covariances were held constant, tested the equality of factor variances and covariances across groups. Finally, the fourth model, which was the most restricted, examined the similarity of the residual (unique) variances and covariances across groups. Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Incremental Fit Index (IFI) were used as the criterion indexes to examine the fit between each model and the sample data. Once the fit of each model was established, the chi-square difference between adjacent models was used to assess the support for equality constraints (Byrne, 2001). The goodness-of-fit statistics generated for this set of models are presented in Table 5. 3.

Table 5. 3 Summary of invariance test of the factorial structure of place attachment

Model	χ^2	df	χ^2/df	$\Delta\chi^2$	Δdf	RMSEA	CFI	IFI
Baseline model (entire sample)	270.488	83	3.259			.078	.929	.929
Model 1: Equality of structure	390.399	166	2.352			.061	.917	.918
Model 2: Equality of factor loadings	414.213	178	2.327	23.814	12	.060	.912	.913
Model 3: Equality of factor variances/covariances	416.372	184	2.263	2.159	6	.059	.914	.915
Model 4: Equality of residual variances/covariances	449.415	203	2.214	33.043	19	.058	.908	.909

Note: χ^2/df indicates the ration of Chi-square to degrees of freedom. Values between 2-5 indicate acceptable fit (Klem, 2000). $\Delta\chi^2$ is the difference in χ^2 values between adjacent models and Δdf is the difference in number of degrees of freedom between adjacent models.
RMSEA (Root Mean Square Error of Approximation): Values $\leq$ 0.08 indicate acceptable fit (Steiger & Lind, 1980).
CFI (Comparative Fit Index): Values $\geq$ 0.9 indicate acceptable fit (Bentler, 1990).
IFI (Incremental Fit Index): Values $\geq$ 0.9 indicate acceptable fit (Byrne, 2001)

The first model was constructed by imposing the baseline model, namely the modified Group-Factor model of place attachment, simultaneously on the two groups. The key goodness-of-fit indexes of this model were adequate ($\chi^2_{(166)}$=390.399; RMSEA=.061; CFI=.917; IFI=.918), indicating that there was a good fit between the sample data and the baseline model between the groups, or in other words, the imposed three-factor model of place attachment was applicable and similar for both groups. This unconstrained model provided a baseline value against which the subsequent model was compared.

The second model examined the equivalence of factor loadings across the groups, which is typically considered the minimum condition for invariance test (Marsh & Grayson, 1990, p. 207). The goodness-of-fit indexes of this model exhibited adequate fit ($\chi^2_{(178)}$=414.213; RMSEA=.059; CFI=.912; IFI=.913). Moreover, the chi-square difference test did not suggest significantly worse fit ($\Delta\chi^2$=23.814; Δdf=12) at the 0.01 level, thus providing evidence that the measurement weights in the measurement part of the model were constant across group.

For the last two invariance models, in which the factor variances/covariances and the residual variances/covariances were constrained to be equal across groups, sequentially, the goodness-of-fit indexes were all adequate (the third model: $\chi^2_{(184)}$=416.372; RMSEA=.059; CFI=.914; IFI=.915; the fourth model: $\chi^2_{(203)}$=449.415; RMSEA=.058; CFI=.908; IFI=.909), and the chi-square differences also did not suggest any significantly worse fit at the 0.01 level (between the third and the second model: $\Delta\chi^2$=2.159; Δdf=6; between the fourth and the third model: $\Delta\chi^2$=33.043; Δdf=19). Indeed, according to the RMSEA value, the last invariant model, in which all the parameters concerned were held equal across groups, exhibited the best fit to the data than the other models considered in this set of invariance tests.

There appeared to be no significant evidence to suggest that parameter estimates of the baseline model differ between the groups, thus providing support for the measurement invariance of the modified Group-Factor model of place attachment across the two groups. Therefore, this measurement model was included in the path diagrams used to examine Hypothesis 2 and the results reported in the following section were based on single-group analyses of the entire sample.

5.2. Examining the Sources and Mechanism of Place Attachment

What are the factors that may contribute to place attachment? What might be the mechanism that underlies the development of place attachment? This section presents the results of the examination of Hypothesis 2 which concerns the sources and mechanism of place attachment. First, the direct effects of each hypothesized predictive domain on place attachment were examined individually. The purpose was to find out the significant predictors of place attachment within each domain, namely, socio-economic factors, factors pertaining to the characteristics of place, place experience factors, place perception factors, place satisfaction factors, and place meaning factor. Second, the direct effects of the significant factors identified in the first section on place attachment were examined. The purpose was to find out how each of these significant predictors may affect place attachment when included with the other factors. Third, the significance of place meaning in the prediction of place attachment was examined through mediation analyses. The purpose was to find out whether identification with place meanings plays a significant role in mediating the effects of the predictors on place attachment.

5.2.1. The Direct Effects of the Predictor Variables on Place Attachment

What are the relationships between variables within each of the hypothesized predictive domains and place attachment? This section examines the direct effects of the predictor variables on each of the three place attachment dimensions domain by domain.

Effects of Socio-economic Characteristics on Place Attachment

Previous research has suggested that level of place attachment may vary depending on a variety of factors related to people's socio-economic characteristics. To examine the direct effects of socio-economic variables on place attachment, a path model was constructed, in which residents' age, length of residence, their level of environmental knowledge, and their frequency

of environment-related activities were treated as independent variables and the three latent variables representing the dimensions of place attachment were treated as dependent variables.

The path model was examined in AMOS 6.0 and the parameter estimates were reported in Figure 5. 14[30]. The goodness-of-fit indexes suggested an adquate fit of this model to the sample data ($\chi^2_{(131)}$=328.060; RMSEA=.064; SRMR=.041; GFI=.914; CFI=.930; NFI=.890; IFI=.931; TLI=.908). Among the four independent variables, age was the most prominent predictor for all three attachment dimensions. Age was positively associated with park caring (Beta=.226, p<.001), park dependence (Beta=.194, p<.001), and park identity (Beta=.215, p<.001), suggesting that older residents felt significantly more attached to nearby neighborhood park than did younger residents. Frequency of participating environment-related activities was also positively related to the three park attachment (Beta=.186, p<.005; Beta=.152, p<.020; Beta=.147, p<.023 for park caring, dependence, and identity, respectively), whereas level of environmental knowledge only had significant effects on park caring (Beta=.207, p<.002) and park identity (Beta=.136, p<.036), suggesting that the more residents know about the environment in general and the more frequently they engage in environment-related activities, the more likely they may develop strong emotional ties with their nearby neighborhood parks. Length of residence, however, was found having no significant effect on any of the three attachment dimensions, suggesting that in the current study, respondents' length of residence was not related to their level of attachment to neighborhood parks. This model accounted for 16%, 7%, and 10% of the variance in park caring, park dependence, and park identity, respectively.

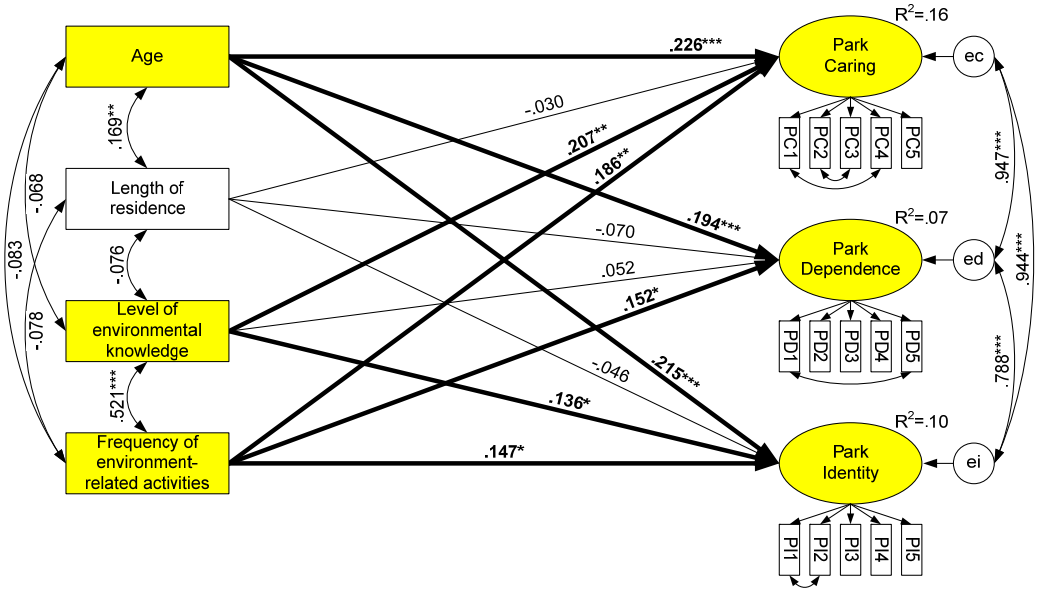


Figure 5. 14 Direct effects of socio-economic variables on park attachment

Using the summative scales created for the three place attachment dimensions, one-way

[30] Significant path coefficients are boldfaced. For the purpose of clarity, parameter estimates of the measurement part of place attachment dimensions are not shown.

analysis of variance did not found significant differences between male and female respondents, though male participants' mean ratings of each attachment dimension appeared to be slightly higher than that of female participants (Table 5. 4). Significant group difference was also not found between ethnic groups (Table 5. 5), though it seemed that Chinese participants generally felt less attached to neighborhood park than did the other two ethnic groups.

Table 5. 4 Difference of park attachment between male and female

Park attachment dimension	Male (n=177)	Female (n=191)	F	Sig.
Park Caring	3.18	3.15	.320	.572
Park Dependence	2.91	2.88	.136	.712
Park Identity	3.06	3.01	.437	.509

Table 5. 5 Difference of park attachment between ethnic groups

Park attachment dimension	Chinese (n=251)	Malay (n=69)	Indian (n=35)	Others (n=13)	F	Sig
Park Caring	3.09	3.25	3.39	3.58	3.961	.008[a]
Park Dependence	2.84	2.90	3.14	3.15	2.192	.089
Park Identity	2.98	3.01	3.30	3.32	2.652	.049[a]

a. Post-hoc analysis (Tukey HSD) did not suggest any group difference that is significant at the 0.05 level.

Effects of Place Characteristics on Place Attachment

As suggested by previous research (Jackson, 1994), one of the potential factors of place attachment is the characteristics of the physical environment of place. Since each of the three neighborhood parks under study represented a specific type of landscape, i.e. geometric, naturalistic, and mixed landscape design, respectively, one-way ANOVA was conducted to compare the meaning ratings of the three summative scales of park attachment dimensions between the three neighborhoods.

As illustrated in Table 5. 6, no significant differences between the three neighborhoods were found regarding the levels of the three park attachment dimensions, except that Woodlands group was more dependent on neighborhood park for recreation than did Choa Chu Kang group. Note that the mean ratings of Chua Chu Kang group were generally lower than the other two groups for all the three attachment dimensions. To determine whether Choa Chu Kang group's park attachment is significantly different from the other two groups, two contrast tests (Table 5. 7) were conducted: first, the meaning ratings of each attachment dimension of Chua Chu Kang group were compared to that of the other two groups; second, Bukit Panjang group was compared to Woodlands group.

The results of contrast tests (Table 5. 8) indicated that Chua Chu Kang group's level of park attachment as represented in all its' three sub-dimensions was significantly different from the other two neighborhoods, whereas the level of park attachment of the latter two groups did not differ significantly from each other, suggesting that those living near neighborhood park with either predominantly naturalistic or geometric landscape, as was the case in Bukit Panjang and Woodlands groups, tended to have stronger attachment to their own park than those whose neighborhood park was not dominated by any of such prominent landscape characteristics, as

was the in Chua Chu Kang neighborhood.

Table 5. 6 ANOVA – Differences between neighborhoods regarding mean ratings of park attachment

Park attachment dimension	Bukit Panjang Neighborhood 5 (n=146)	Choa Chu Kang Neighborhood 7 (n=103)	Woodlands Neighborhood 6 (n=119)	F	Sig
Park Caring	3.22	3.04	3.21	2.088	0.125
Park Dependence	2.90	2.76	3.01	3.096	0.046
Park Identity	3.06	2.90	3.11	2.438	0.089

Table 5. 7 Contrast coefficients

	Neighborhood		
Contrast group	Bukit Panjang Neighborhood 5	Chua Chu Kang Neighborhood 7	Woodlands Neighborhood 6
1	0.5	-1	0.5
2	1	0	-1

Table 5. 8 Results of contrast tests

		Contrast group	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
Park Caring	Assume equal variances	1	0.1678	0.08251	2.033	365	0.043
		2	0.0080	0.08763	0.092	365	0.927
	Does not assume equal	1	0.1678	0.08060	2.081	198.522	0.039
	variances	2	0.0080	0.09021	0.089	237.928	0.929
Park Dependence	Assume equal variances	1	0.1947	0.08666	2.247	365	0.025
		2	-0.1095	0.09204	-1.189	365	0.235
	Does not assume equal	1	0.1947	0.08531	2.282	190.273	0.024
	variances	2	-0.1095	0.09203	-1.189	259.001	0.235
Park Identity	Assume equal variances	1	0.1868	0.08604	2.171	365	0.031
		2	-0.0473	0.09138	-0.517	365	0.605
	Does not assume equal	1	0.1868	0.08318	2.246	199.637	0.026
	variances	2	-0.0473	0.09313	-0.508	253.488	0.612

Since in the above one-way ANOVA the three park attachment dimensions were represented by the three summative scales which were treated as measured variables without taking into account the measurement errors, in order to further verify whether being living near a park with distinct landscape characteristic alone may account for attachment to the park, a path analysis model (Figure 5. 15) was constructed. In this model, park attachment dimensions, which were latent variables associated with their corresponding measurement items and measurement errors, were treated as dependent variables, and a dummy variable, with the value “1” representing being living near a park with landscape that is either predominantly geometric or naturalistic and the value “0” indicating being living near a park that is not characterized by any of the two types of landscapes, was treated as independent variable. Put in another way, value “1” was assigned to the place characteristic dummy variable for all Bukit Panjang and Woodlands participants, because their neighborhood park were characterized by naturalistic and geometric landscape, respectively, and value “0” was assigned to the dummy variable for all Choa Chu Kang participants, whose neighborhood park is not dominated by a specific type of landscape.

The path model was tested via structural equation modeling technique in AMOS 6.0 and the goodness-of-fit indexes indicated adequate fit ($\chi^2_{(95)}$=305.887; RMSEA=.074; SRMR=.044; GFI=.910; CFI=.927; NFI=.896; IFI=.928; TLI=.908). Moreover, the three regression coefficients leading to the three park attachment dimensions were all significant, suggesting that those living near neighborhood park with landscape that is either predominately naturalistic or geometric had stronger attachment to their own park than did those whose neighborhood park had no clearly manifested characteristics. In other words, the results suggested that the salience of place characteristic might be a factor of place attachment. However, the contribution of physical characteristic of neighborhood park landscape to park attachment seemed to be rather small, as indicated by the R^2 values associated with each attachment dimension, suggesting that place characteristics alone did not account for a large proportion of the variance of place attachment in current case.

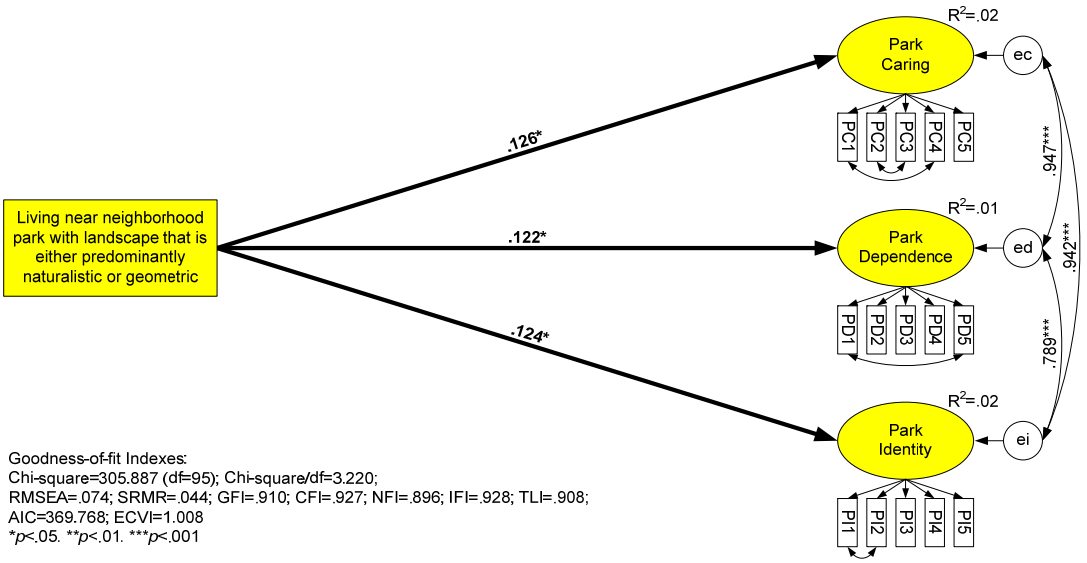


Figure 5. 15 Direct effects of park characteristics on park attachment

Effects of Place Experience on Place Attachment

Previous research has demonstrated that how people experience a place may affect their attachment to the place. To examine the effects of park-related experiences on park attachment, two path models were constructed, in which the three park activities scales derived from factor analysis and the park-based social interaction scale were treated as independent variables, respectively, and the three park attachment dimensions were treated as dependent variables.

The results indicated that both models exhibited adequate fit (Figure 5. 16, Figure 5. 17). As illustrated in Figure 5. 16, compared with the other two park-based activities, passive recreation was the most prominent predictor as it was positively associated with all three attachment dimensions (Beta=.190, p<.002; Beta=.302, p<.001; Beta=.286, p<.001, for park caring, dependence, identity, respectively), suggesting that the more frequently residents had passive recreation inside nearby neighborhood park, the stronger their attachment to the park. Being with family members was found contributing significantly only to park caring (Beta=.263,

p<.001) and park identity (Beta=.147, p<.014), suggesting that the more residents use neighborhood park as a family place, the more they will care about and commit to the park, and the stronger their self-identity in relation to the park, but being with family did not necessarily imply a functional dependence on neighborhood park. It was also found that being with family contributed more to park caring than did passive recreation, which, on the other hand, had stronger effect on park identity than did being with family. Frequency of active recreation, however, was not related to any of the attachment dimensions, suggesting that active recreation may not be a direct source of park attachment. The three activity scales together accounted for 17%, 12%, and 15% of the variances in park caring, park dependence, and park identity, respectively, suggesting that park-based activities had medium direct effects on park attachment (Cohen, 1988).

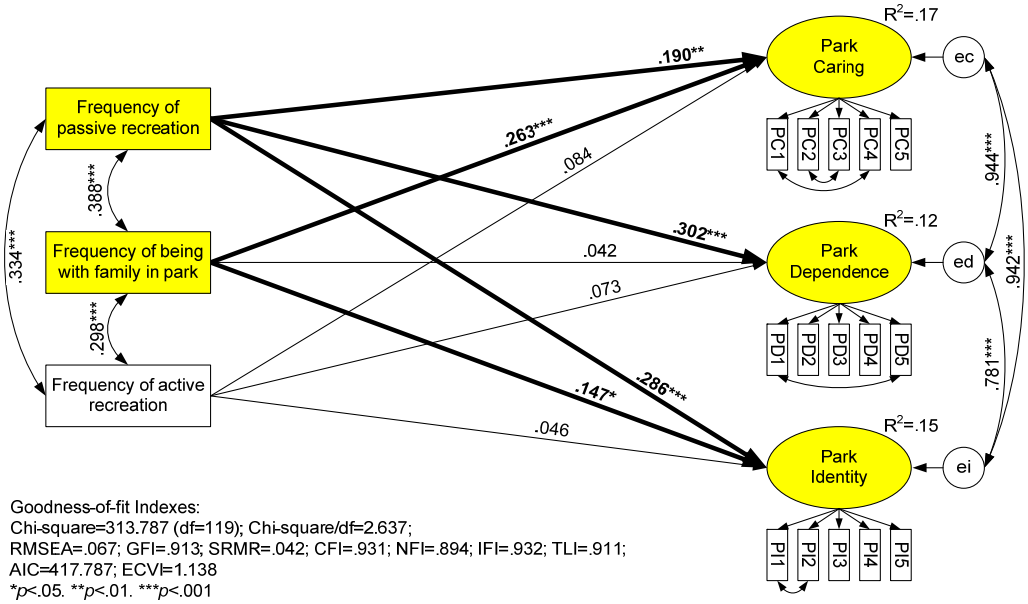


Figure 5. 16 Direct effects of park-based activities on park attachment

Park-based social interaction was also found significantly associated with all three attachment dimensions (Figure 5. 17), suggesting that the more frequently residents socialize with friends and neighbors inside their nearby neighborhood park, the stronger their attachment to the park. However, the effect of socialization only accounted for a small proportion of the variance in park attachment, as indicated by the R^2 values associated with each attachment dimension.

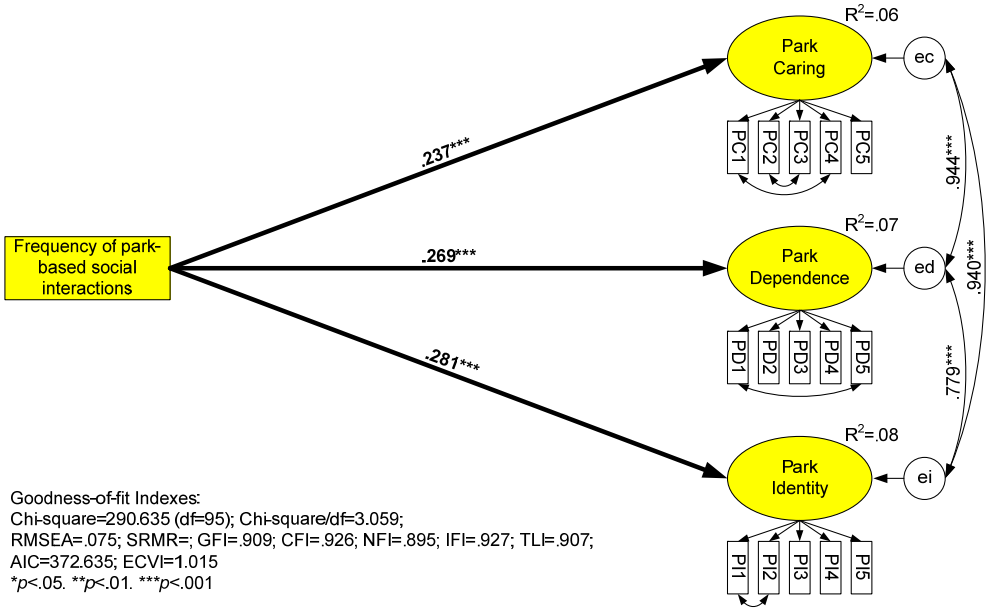


Figure 5. 17 Direct effects of park-based social interactions on park attachment

Effects of Place Perception on Place Attachment

The fourth set of analyses was concerned with the effects of place perception on place attachment. It is argued that how a person perceives the characteristics of the physical environment of a place may affect his or her understanding of the embedded meanings of that place, which in turn will influence the emotional bonding with that place. In this study, residents' perceptions toward neighborhood parks were explored via first, their preference of the landscape of neighborhood parks and second, the perceived uniqueness of the park design features.

In the first path model, the four park landscape preference scales derived from factor analysis were treated as independent variables. As illustrated in Figure 5. 18, this model had achieved adequate fit to the data. It was found that preference for geometric landscapes was positively associated with all three attachment dimensions, and preference for naturalistic landscapes was only positively related to park dependence and identity, whereas preferences for manicured and pathway landscapes were not related to any attachment dimension. The results indicate that the more residents like open spaces characterized by geometric or naturalistic landscape, the stronger their attachment to neighborhood park.

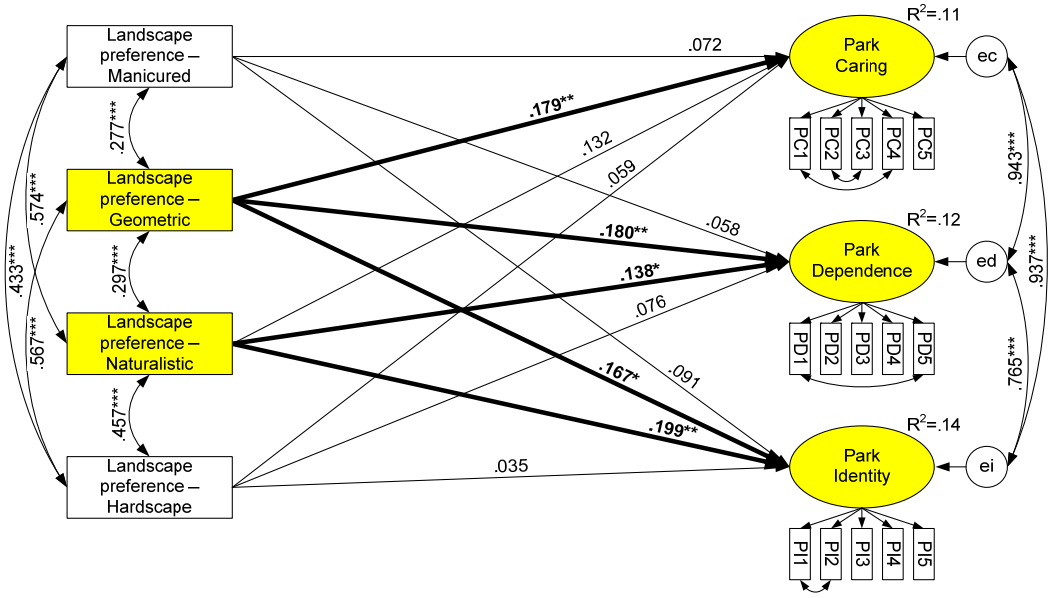


Figure 5. 18 Direct effects of landscape preferences on park attachment

Although the results may seem to echo what the results shown in Figure 5. 15 suggest, the independent variables in the two models actually imply different attributes: the state of being living near neighborhood park with predominant landscape characteristic or not is a place-specific attribute of a person, whereas landscape preference which is a cognitive attribute of an individual that can be affected by a variety of factors, such as cultural background, environmental consciousness, and personal experiences, is not a place-specific personal attribute. Therefore, it is not tenable to claim that being fond of a specific type of park landscape may imply that one will definitely develop emotional bond with his or her own neighborhood park regardless of the fact that the actual landscape of the park may or may not match the type of landscape one personally prefers. In other words, the statistically significant relationships between the non-place-specific independent variables, i.e. park landscape preferences, and the place-specific dependent variable, i.e. park attachment, found here did not seem to lend support to any reasonable explanation.

In regard to this, an alternative path model was constructed, in which a place-specific landscape perception scale, which indicated residents' preference for the landscape of their own neighborhood park, was created and treated as predictor of park attachment. The purpose was to examine whether positive appreciation of the landscape of one's own park, without concerning the specific design contents or style of the park landscape, may contribute to park attachment. As illustrated in Figure 5. 19, this model fit the sample data adequately. Preference for one's own park was positively related to all three park attachment dimensions, with the association with park dependence being the strongest (Beta=.416, p<.001), followed by park identity (Beta=.387, p<.001) and park caring (Beta=.335, p<.001). The results suggest that the more residents like the landscape of their own neighborhood park, regardless of the characteristic of the park landscape, the stronger their functional dependence on the park, the

stronger their self-identity related to the park, and the stronger their care for and concern to the park. In other words, positive appreciation of the physical characteristics of the nearby neighborhood park did seem to contribute to the development of emotional bond with the park setting.

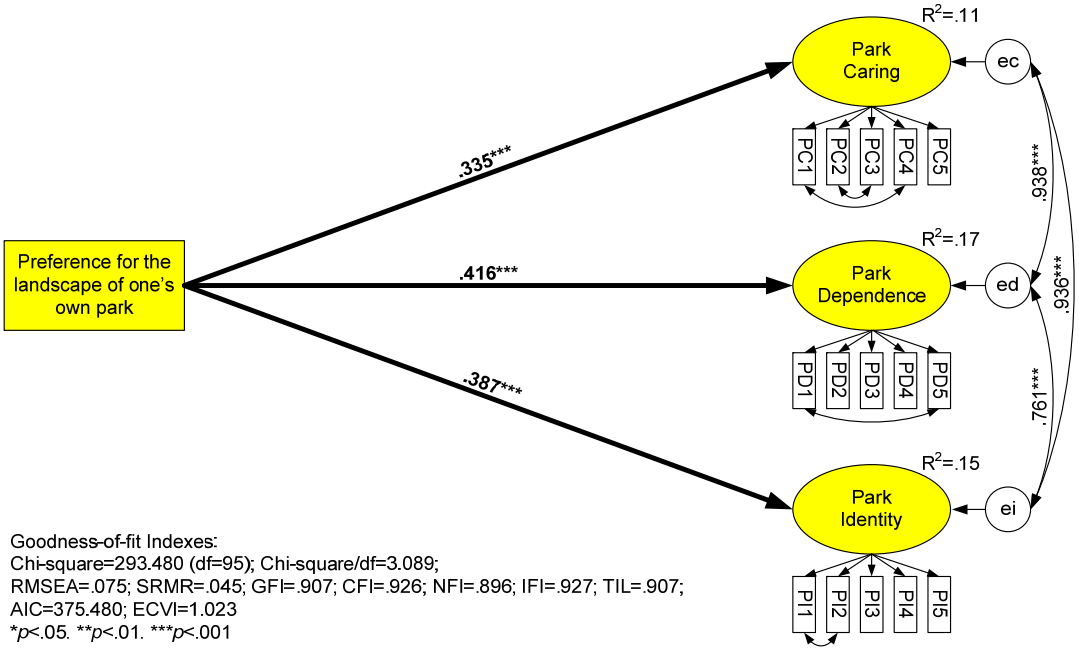


Figure 5. 19 Direct effect of preference for one's own park on park attachment

Next, the effects of perceived uniqueness of park design features on park attachment were examined via path model, in which the two perceived uniqueness scales were treated as independent variables. The results indicated that the model achieved adequate fit (Figure 5. 20). Both scales were positively associated to all the three attachment dimensions, suggesting the more residents agreed that the design elements in their own neighborhood park possess unique characteristics that are distinct from that of the other open spaces, the stronger their attachment to the park. Generally speaking, the effects of uniqueness of natural elements on both park caring and park identity were stronger than that of artificial elements, whereas the effect of the latter on park dependence was slightly stronger than that of the former. In other words, unique natural design features seem to be more effective in terms of enhancing residents' self-identity and encouraging their care of and commitment to their own neighborhood park. On the other hand, unique artificial design elements may suggest good support for park-based recreation uses, thus leading to a higher degree of functional dependence on neighborhood park. The two uniqueness scales accounted for a relatively larger proportion of the variance in park dependence (R^2=.20) than for park identity (R^2=.19) and park caring (R^2=.12).

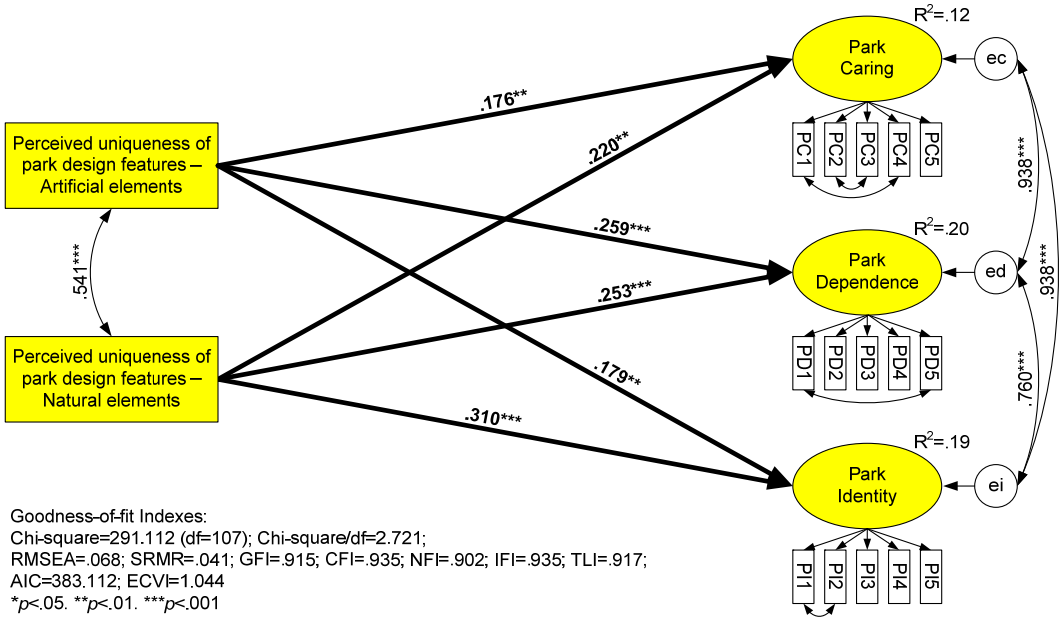


Figure 5. 20 Direct effect of perceived uniqueness of park design features on park attachment

Effects of Place Satisfaction on Place Attachment

As argued in Research Needs section, place satisfaction and place attachment are distinct constructs and the former is expected to be a contributor to the latter. To examine whether place-specific quality assessment may affect place attachment, two path models were constructed, in which the two park quality evaluation scales derived from factor analysis and the summative general park satisfaction scale were treated as independent variables, respectively.

As illustrated in Figure 5. 21 and Figure 5. 22, both models had achieved adequate fit. In terms of the effects park quality evaluation scales (Figure 5. 21), perceived quality of the natural environment of neighborhood park was found to be a significant predictor of all the three park attachment dimensions, suggesting that the more residents are satisfied with the natural quality of their own neighborhood park, such as the scenic quality, species of wildlife and plants, spaciousness, naturalness, and coolness of the park environment, the stronger their attachment to the park. Besides, natural quality seemed to affect park dependence the most (Beta=.510, p<.001), followed by park identity (Beta=.475, p<.001) and park caring (Beta=.342, p<.001): park environment regarded as having good natural quality may lead to higher functional dependence on the park, stronger self-identity in reference to the park, and to a lesser extent, stronger desire to care for and commit to the park. On the other hand, whether or not it is easy to find one's way in the park or whether the park is regarded a comfortable place to stay did not seem to have significant effects on attachment to the park.

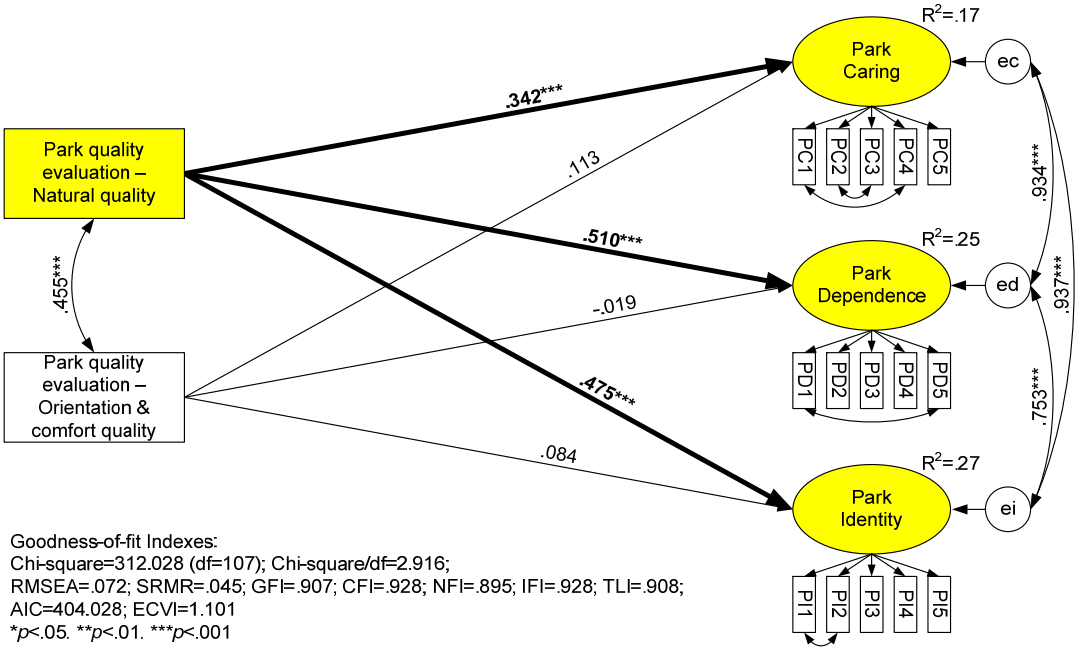


Figure 5. 21 Direct effect of park quality evaluation on park attachment

It was also found that respondents' level of satisfaction with the general quality of their own neighborhood park, which was an overall evaluation of park environment, was positively associated with all the three park attachment dimensions (Figure 5. 22), with the its contribution to park identity being the greatest (Beta=.496, p<.001), followed by park dependence (Beta=.474, p<.001) and park caring (Beta=.385, p<.001). The general park satisfaction scale accounted for quite a large proportion of the variance in park attachment, as indicated by the R^2 values associated with each attachment dimension, ranging from .15 to .25. The results suggest that the more residents are satisfied with the various aspects of the environment of their own neighborhood park, the more likely they may develop an emotional tie with the park. In other words, positive evaluation of the general quality of a place may be a significant contributor to place attachment.

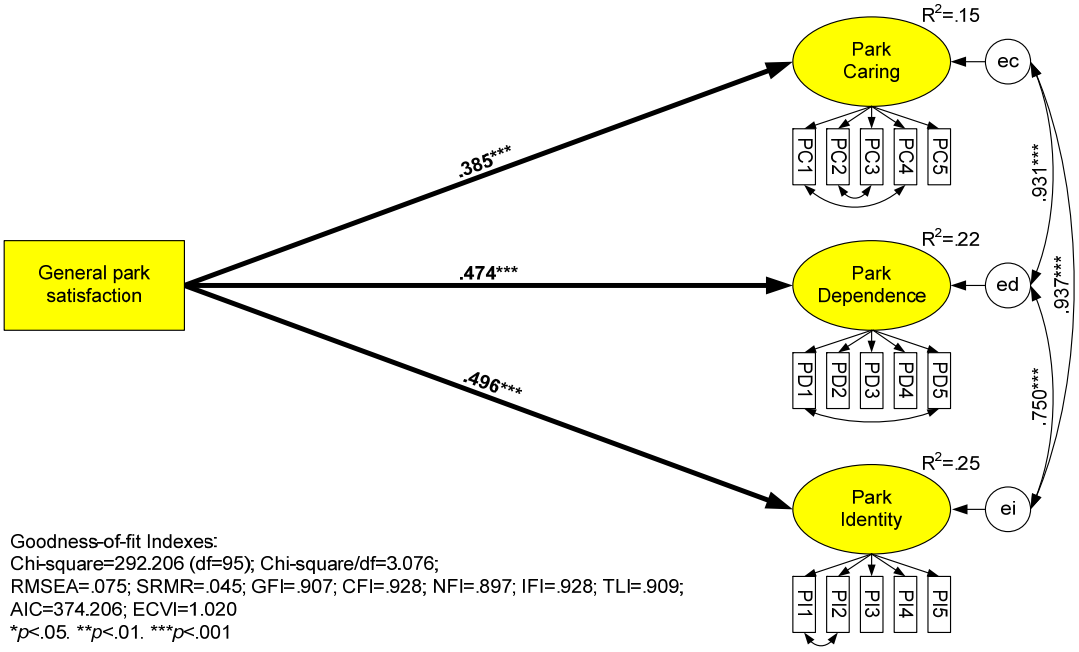


Figure 5. 22 Direct effect of general park satisfaction on park attachment

Effects of Identification with Place Meanings on Place Attachment

Since meaning lies at the heart of place concept, it is hypothesized that place attachment is also a meaning-based construct. In other words, the development of attachment to a place may depend on how the meaning of the place is understood and appreciated. To examine the direct effect of place meaning on place attachment, a path model was constructed, in which the scale indicating residents' level of agreement with the meanings associated with neighborhood park, i.e. the general park meaning scale derived from factor analysis, was treated as independent variable.

The results (Figure 5. 23) indicated that the fit of the direct effect model was adequate ($\chi^2_{(95)}$=286.724; RMSEA=.074; SRMR=.043; GFI=.910; CFI=.932; NFI=.902; IFI=.933; TLI=.914). The associations between level of identification with the meanings ascribed to neighborhood park and the three park attachment dimensions were all significant and strong. Identification with park meanings contributed the most to park identity (Beta=.685, p<.001), followed by park dependence (Beta=.606, p<.001) and park caring (Beta=.548, p<.001). Compared with the effects of the other predictors reported above, the general park meaning scale alone accounted for the largest proportion of the variance in park attachment, as indicated by the relatively high R^2 values associated with each attachment dimension: 47%, 37%, and 30% of the variance in park identity, park dependence, and park caring, respectively, can be attributed to the influence of the park meaning scale. The results suggest that the more residents agree with the meanings symbolized by their own neighborhood park, the more likely they may develop a strong self-identity in reference to the park, a stronger functional reliance on the park, and a stronger care for and commitment to the park. In other words, the findings provide substantial evidence that to a great extent, the emotional bond with a place might be a function of how the shared meanings attributed to the place are apprehended and accepted.

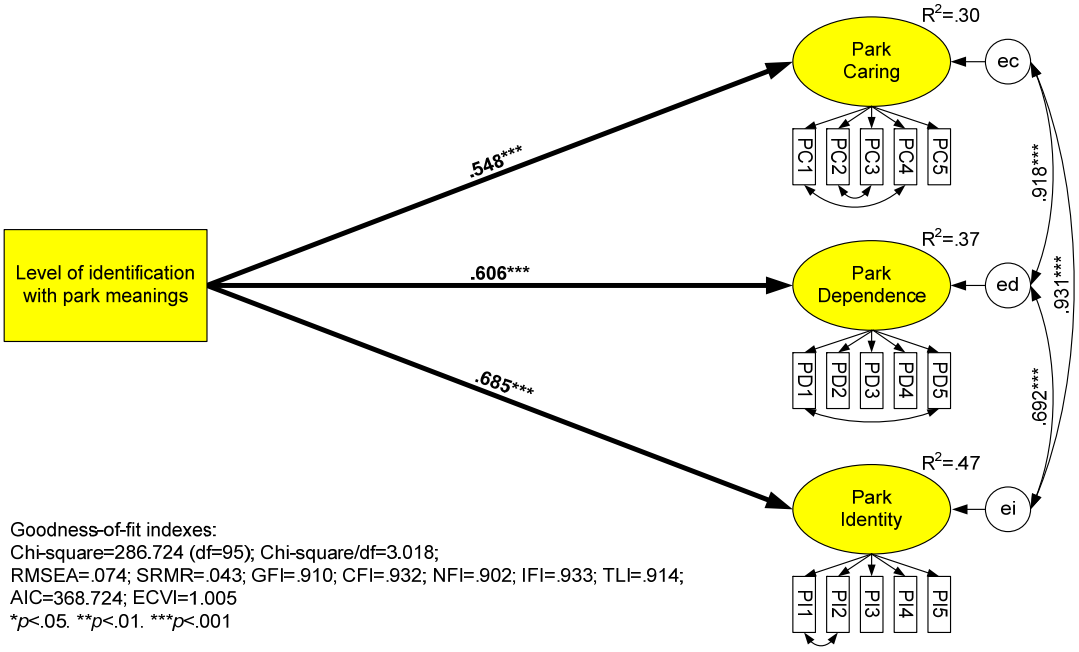


Figure 5. 23 Direct effect of identification with park meanings on park attachment

Generally speaking, in terms of the proportion of the variance explained, the model involving place meaning variable offered the best prediction of place attachment. This was followed by the model involving place satisfaction indicators, the model with place perception indicators, and the model with place experience indicators. In contrast, the model involving socio-economic variables and the model with place characteristic indicator only provided a weak prediction of place attachment.

5.2.2. The Relative Effects of the Predictor Variables on Place Attachment

What are the effects of the predictors on place attachment when considered together with the others? Although the results of the preceding analyses provided information on the individual direct relationships between predictor variables and place attachment, they did not inform us the relative importance of these independent variables in the prediction of place attachment when taken into account with the others. This section examines the relative contributions of the significant predictors of place attachment. A path model was constructed, in which the significant predictors within each domain as identified in the previous analyses were included together as independent variables. The purpose was to examine the direct effects of the significant predictors within a specific domain by controlling the effects of the predictors belonging to the other domains. As recommended by previous research (Bonaiuto, et al., 1999, p. 338), this approach is relatively conservative in that, by including only the best predictors from each domain, the number of parameter to be estimated can be reduced dramatically, thus resulting in a better ratio between sample size and parameter and a more reliable parameter estimation.

As illustrated in Figure 5. 24, this model obtained excellent fit indexes ($\chi^2_{(263)}$=517.116; RMSEA=.051; SRMR=.036; GFI=.914; CFI=.947; NFI=.902; IFI=.949; TLI=.913). The fifteen variables did a good job in the prediction of place attachment in that, together, they accounted

for quite a large proportion of the variances in the three attachment dimensions: 61% for park identity, 48% for park caring, and 53% for park dependence, as indicated by the R^2 values associated with them. The results also showed that eight out of the fifteen predictor variables still exerted significant effects on place attachment, suggesting that each predictive domain was somewhat important in determining place attachment, however, the relative importance of each group of predictors in the prediction of place attachment varied across attachment dimensions.

Four variables were significantly and positively related to park caring. Place meaning domain was the most influential: level of identification with park meanings (Beta=.384, $p<.001$) was found to be the strongest predictor of park caring, suggesting that the more residents agree with the meanings symbolized by their own neighborhood park, the stronger their park caring. Place experience and place characteristic domains played a relatively less important role. Among the place experience factors, only frequency of being with family in park (Beta=.186, $p<.001$) was found to be a significant contributor to park caring, suggesting that family-member involved activities inside neighborhood park may strengthen attachment to the park in that they tend to foster stronger care for and concern of the park. Place characteristic (Beta=.131, p=.007) also seemed to a factor that may affect park caring: those who live near neighborhood park with either predominantly geometric or naturalistic landscape tended to have stronger park caring. Finally, socio-economic variables (Beta=.113, p=.043) seemed to be the least influential: level of environmental knowledge was the only significant predictor within this domain, suggesting that those residents who are more knowledgable about the global environment and the critical issues related to it may tend to care more about the condition of their own neighborhood park and exhibit stronger commitment to the park as represented by willingness to invest their own time and resources in park-related activities. Place perception and satisfaction variables, however, did not seem to have significant effects on park caring when considered with the predictors from the other domains[31].

Five predictors were found significantly and positively related to park dependence. Identification with park meanings was still the strongest predictor (Beta=.403, $p<.001$), suggesting that the more residents agree with the meanings represented by their own neighborhood park, the more they may consider it as an irreplaceable place for recreation activities. This was followed by place perception and satisfaction domains: preference for the landscape of one's own park (Beta=.233, p=.002) and natural quality of the park (Beta=.167, p=.043) were found positively associated with park dependence, suggesting that the more residents like the landscape of their own neighborhood park and the more they are satisfied with the natural quality of their own park, the more they may depend on the park for recreation. To a lesser extent, place experience was also a significant predictor: among the place experience factors, frequency of passive recreation was positively related to park dependence (Beta=.147, p=.013), suggesting that passive recreation might be more place-dependent than the other types of recreation activities. Finally, place characteristic was the least influential factor: those who live near neighborhood park with either predominantly geometric or naturalistic landscape tended to have stronger

[31] Why some of the factors that were significant in the previous direct effect models became insignificant in the composite model might be due to their correlations with the other stronger predictors.

functional reliance on the park (Beta=.088, p=.046). Socio-economic variables, however, was the only factor that did not related to park dependence when considered with the others.

Four variables were found positively associated with park identity. Place meaning was the strongest predictor of place identity (Beta=.497, p<.001), suggesting that the more residents identify with the symbolic meanings of neighborhood park, the more likely they may relate the park to themselves and see it as a symbolic representation of their own self-identity. This was followed by place satisfaction and perception domains: perceived natural quality of the park environment (Beta=.171, p=.029) and perceived uniqueness of natural design features (Beta=.104, p=.048) were found to be significant predictors of park identity. Finally, place characteristic was marginally related to place identity: those who live near neighborhood park with either predominantly geometric or naturalistic landscape tended to have stronger park identity (Beta=.098, p=.019). Socio-economic background and place experience variables did not seem to have significant effects on place identity when considered with the other factors.

The results indicated that place characteristic and place meaning were the only significant factors that were consistently associated with all three attachment dimensions when involved with the other predictors. Though the effect was consistently the smallest, the presence of a prominent landscape characteristic alone, either geometric or naturalistic, did contribute to place attachment, net of the influences of the other factors. In contrast, the effects of identification with park meanings on each of the attachment dimensions were consistently the strongest. Together with the findings reported in the preceding section, the results provide further evidences to support the hypothesis that place meaning is the most prominent predictor of place attachment, either considered independently or taking into account the effects of the other significant predictors of place attachment.

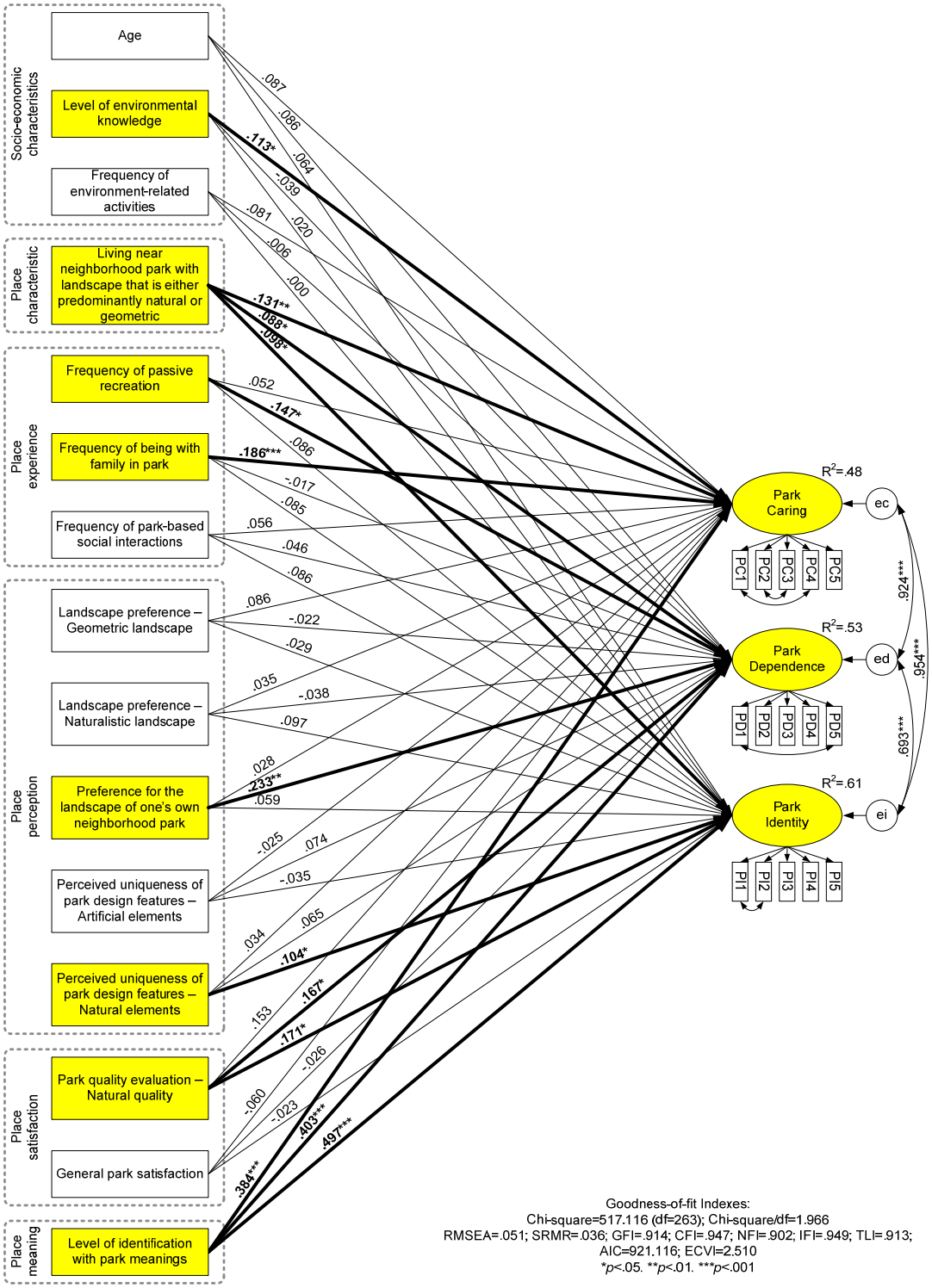


Figure 5. 24 Direct effects of significant predictors on park attachment

(For the purpose of clarity, correlations between the predictor variables are not shown. Please refer to Appendix G for the correlation coefficients.)

5.2.3. The Role of Place Meaning in the Prediction of Place Attachment

What is the mechanism that underlies the development of place attachment? The analyses conducted in the preceding sections only examined the direct associations of the hypothesized predictor variables with place attachment without exploring the casual relationships between the independent variables. As indicated by the results reported in the preceding sections, place meaning seemed to be the most prominent construct in term of the relationship with place attachment. Based on these empirical evidences and the theorization elucidated in Research Needs section that emphasizes identification with place meanings as the most crucial prerequisite for place attachment, Hypothesis 2a, which concerns the key mediating role that place meaning plays in the development of place attachment, was examined via mediation analyses. The purpose was to explore whether or not and to what extent the relationships between each of the predictor variables and place attachment is mediated via their contributions to place meanings.

Effects of Socio-economic Characteristics on Place attachment as Mediated via Place Meaning

Following the procedures delineated in Research Methodology section, the first set of mediation analyses were conducted for the exogenous structural factors related to residents' socio-economic characteristics, namely, age, length of residence, level of environmental knowledge, and frequency of participating environment-related activities.

Two path models were constructed: in the first model, the direct effect model (Figure 5. 25), the direct effects of the socio-economic variables on park attachment dimensions were examined; the second model, the mediational model (Figure 5. 26), examined whether the effects of the socio-economic variables on park attachment are partially or completely mediated via their contributions to place meaning. As shown in Figure 5. 25 and Figure 5. 26, the goodness-of-fit indexes of both models were well within the acceptable range, indicating a good fit to the data. The detailed parameter estimates of each model are reported in Table 5. 9 and Table 5. 10.

- The Direct Effect Model

As explained in Research Methodology section, the first step of mediation analysis is to examine whether the predictor variable has significant direct effect on the outcome variable without taking into account the effect of the mediator variable. The results of the direct effect model (Table 5. 9) were actually identical to that reported in Figure 5. 14: age and frequency of environment-related activities had significant and positive direct effects on all three attachment dimensions, whereas level of environmental knowledge only affected park caring and park identity. Length of residence did not have significant effects on any attachment dimension. This group of variables accounted for 16% of the variance in park caring, 7% for park dependence, and 10% for park identity.

- The Mediational Model

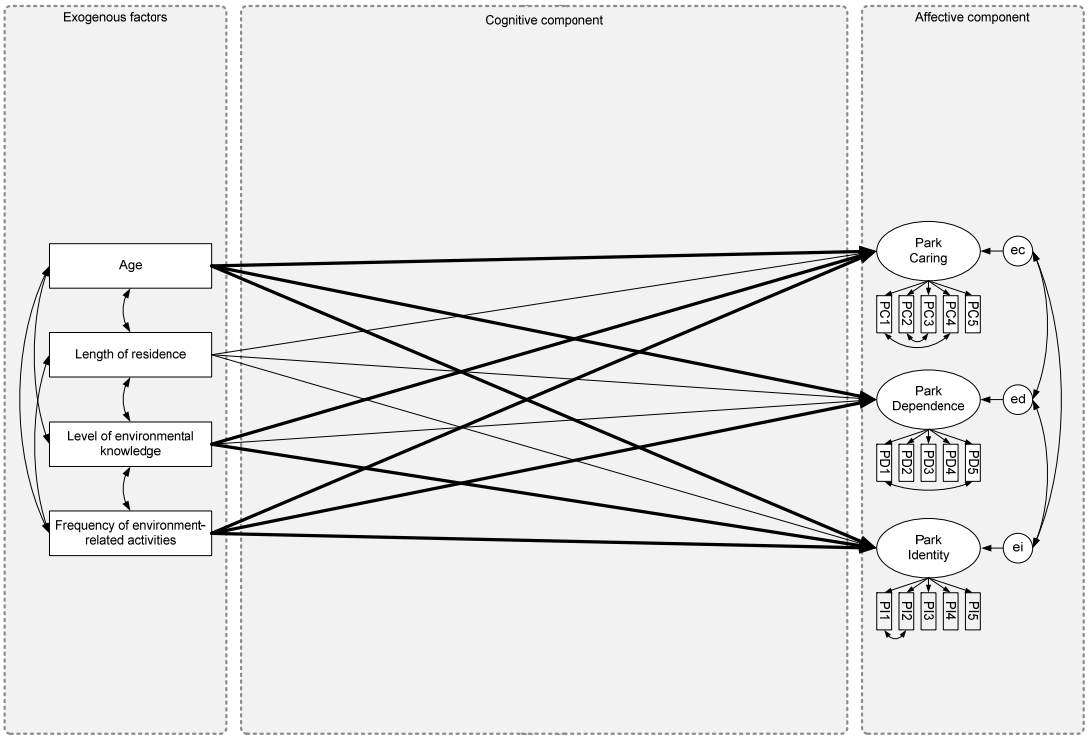
The second step of mediation analysis is to examine whether the predictor variable is related to the mediator variable. In the mediational model (Figure 5. 26) level of identification with park meanings was introduced as the mediator variable. As reported in Table 5. 10, only age was found to have significant effect on the mediator variable, identification with park meanings

(Beta=.171, p<.001).

The third step of mediation analysis is to show that the mediator variable affects the outcome variable, controlling for the effect of the predictor variable. The results indicated that level of identification with park meanings had significant effects on park caring (Beta=.483, p<.001), park dependence (Beta=.582, p<.001), and park identity (Beta=.648, p<.001) over and above the effects of the socio-economic variables. Thus, the significant relationship between the mediator variable and the outcome variable was supported.

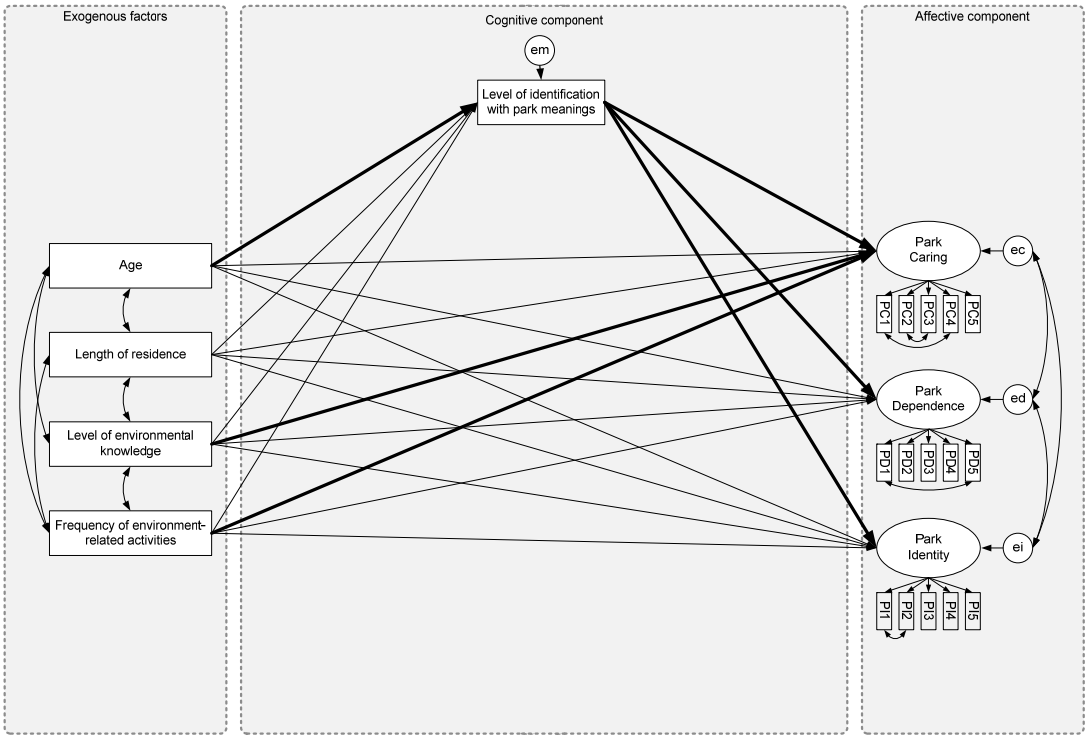
The last step of mediation analysis is to show that the effect of the predictor variable on the outcome variable decrease significantly compared with the effect in the first step after controlling for the effect of the mediator variable. As shown in Table 5. 10, the direct effect of age on park attachment did decrease significantly subsequent to the introduction of the park meaning scale: the effect of age dropped from .226 to .143 (p=.005) for park caring, from .194 to .095 (p=.049) for park dependence, and from .215 to .105 (p=.021) for park identity. On the other hand, age also had significant indirect effects on park attachment via level of identification with park meanings: .171*.483=.083 (z=2.625, p=.004) for park caring, .171*.582=.099 (z=1.954, p=.005) for park dependence, and .171*.648=.111 (z=2.236, p=.006). Therefore, the results indicate that park meaning was a partial mediator of the relationship between age and park attachment: about 36.7% (.083/.226), 51.0% (.099/.194), and 51.6% (.111/.226) of the total effects of age on park caring, park dependence, and park identity, respectively, were mediated via the park meaning scale. These findings suggest that why older residents feel more attached to nearby neighborhood park is partly because that they are more likely to agree with the meanings as represented by the park, which in turn, contributes to the development of emotional tie with these nearby open spaces.

It was also found that the effects of level of environmental knowledge and frequency of environment-related activities on park caring dropped from .207 to .151(p=.009) and .186 to 1.35 (p=.021), respectively, and their direct effects on park dependence and park identity became insignificant. However, since both of them had no direct effects on the park meaning scale, the results can only suggest that level of environmental knowledge and frequency of environment-related activities may affect park attachment, but the effects are not likely to be mediated via their contributions to park meanings.



Goodness-of-fit Indexes:
Chi-square=328.060 (df=131); Chi-square/df=2.504; RMSEA=.064; SRMR=.041; GFI=.914; CFI=.930; NFI=.890; IFI=.931; TLI=.908; AIC=446.060; ECVI=1.215

Figure 5. 25 Path model of the direct effects of socio-economic variables on park attachment



Goodness-of-fit Indexes:
Chi-square=344.398 (df=143); Chi-square/df=2.408; RMSEA=.062; SRMR=.040; GFI=.914; CFI=.933; NFI=.892; IFI=.934; TLI=.911; AIC=478.398; ECVI=1.304

Figure 5. 26 Path model of the effects of socio-economic variables on park attachment as mediated via park meaning

Table 5. 9 Effects of the socio-economic variables on park attachment - parameter estimates of the direct effect model

	Dependent Variable		
Independent Variable	Park Caring	Park Dependence	Park Identity
Age	.099 .025 (p<.001) [.226] ***	.095 .028 (p<.001) [.194] ***	.098 .026 (p<.001) [.215] ***
Length of residence	-.015 .028 (p=.588) [-.030]	-.040 .032 (p=.209) [-.070]	-.024 .030 (p=.412) [-.046]
Level of environmental knowledge	.169 .053 (p=.002) [.207] **	.047 .059 (p=.424) [052]	.116 .055 (p=.036) [.136] *
Frequency of environment-related activity	.154 .054 (p=.005) [.186] **	.140 .060 (p=.020) [.152] *	.127 .056 (p=.023) [.147] *
R^2	.16	.07	.10

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 10 Effects of the socio-economic variables on park attachment - parameter estimates of the mediational model

	Dependent Variable			
Independent Variable	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.071 .021 (p<.001) [.171] ***	.062 .022 (p=.005) [.143] **	.046 .023 (p=.049) [.095] *	.048 .021 (p=.021) [.105] *
Length of residence	.008 .025 (p=.742) [.017]	-.019 .025 (p=.439) [-.038]	-.046 .027 (p=.091) -.080	-.031 .024 (p=.199) -.057
Level of environmental knowledge	.089 .046 (p=.054) [.114]	.124 .047 (p=.009) [.151] **	-.013 .050 (p=.788) [-.015]	.053 .045 (p=.239) [.061]
Frequency of environment-related activity	.085 .047 (p=.072) [.107]	.111 .048 (p=.021) [.135] *	.083 .051 (p=.104) [.089]	.067 .045 (p=.135) [.077]
Identification with park meanings		.505 .066 (p<.001) [.483] ***	.679 .066 (p<.001) [.582] ***	.715 .061 (p<.001) [.648] ***
R^2	.06	.37	.39	.49

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Effects of Place Characteristics on Place attachment as Mediated via Place Meaning

Mediation analyses were also conducted for the place characteristic variable. Two path models were constructed: the direct effect model (Figure 5. 27) examined direct effect of the dummy variable, which indicated whether respondent lives near neighborhood park with prominent landscape characteristic, either geometric or naturalistic, on park attachment; the mediational effect model (Figure 5. 28) examined whether the effect of park characteristic on park attachment will decrease or reduce to insignificant subsequent to the introduction of the park meaning scale. Both models achieved adequate fit to the data and the detailed parameter estimates are reported in Table 5. 11 and Table 5. 12.

- The Direct Effect Model

The results of the direct effect model (Table 5. 11) were identical to that reported in Figure 5. 15: those living near neighborhood parks with either predominantly naturalistic or geometric landscape tended to have stronger park caring, park dependence, and park identity, though the variance in park attachment accounted for by park characteristic was rather small, as indicated by the R^2 values associated with the attachment dimensions.

- The Mediational Model

As shown in Table 5. 12, the effects of park characteristics on park attachment dropped from .126 to .107 (p=.034) for park caring, from .122 to .101 (p=.032) for park dependence, and from .124 to .100 (p=.024) for park identity in the mediational effect model. However, the decrease did not seem to be caused by the introduction of the park meaning scale because the relationship between the park characteristic scale and the park meaning scale was insignificant (Beta=.035, p=.498). Thus, the mediational role of place meaning in this model could not be justified. The results suggest that the prominence of the physical characteristics of a place do have some effects on the emotional bond connected to the place, but the effect may not be mediated via their influences on identification with the meanings attributed to the place.

Table 5. 11 Effects of park characteristics on park attachment - parameter estimates of the direct effect model

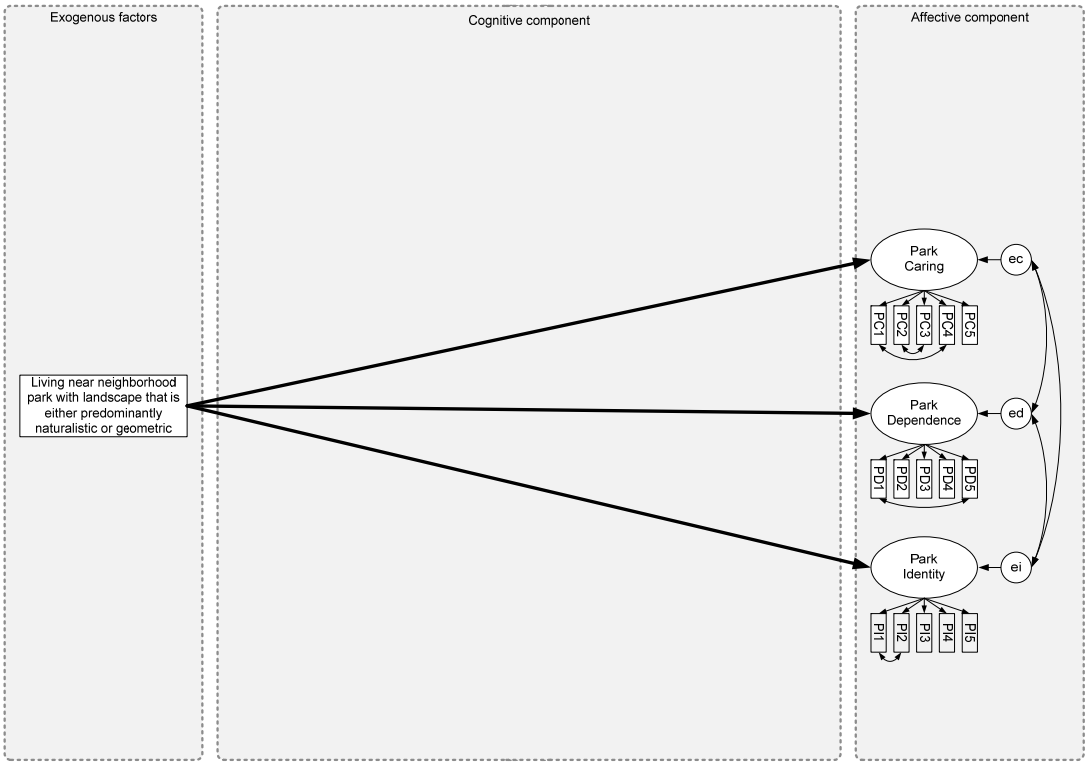
	Dependent Variable		
Independent Variable	Park Caring	Park Dependence	Park Identity
Living near neighborhood park with landscape that is either predominantly naturalistic or geometric	.171 .079 (p=.030) [.126]*	.183 .085 (p=.031) [.122]*	.174 .080 (p=.029) [.124]*
R^2	.02	.01	.02

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 12 Effects of park characteristics on park attachment - parameter estimates of the mediational model

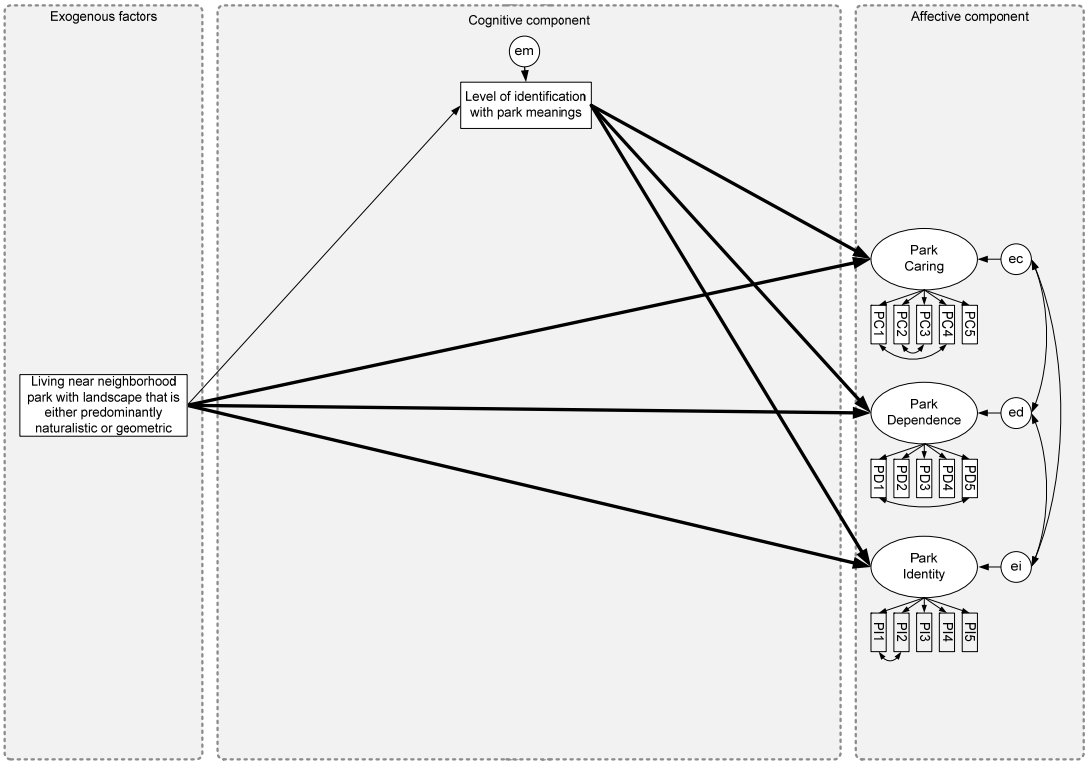
	Dependent Variable			
Independent Variable	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Living near neighborhood park with landscape that is either predominantly naturalistic or geometric	.045 .067 (p=.498) [.035]	.145 .069 (p=.034) [.107]*	.151 .070 (p=.032) [.101]*	.142 .063 (p=.024) [.100]*
Identification with park meanings		.576 .070 (p<.001) [.544]***	.703 .066 (p<.001) [.602]***	.750 .061 (p<.001) [.681]***
R^2	.00	.31	.38	.48

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001



Goodness-of-fit Indexes:
Chi-square=287.768 (df=95); Chi-square/df=3.029; RMSEA=.074; SRMR=.044; GFI=.910; CFI=.927; NFI=.896; IFI=.928; TLI=.908; AIC=369.768; ECVI=1.008

Figure 5. 27 Path model of the direct effects of park characteristics on park attachment



Goodness-of-fit Indexes:
Chi-square=304.022 (df=107); Chi-square/df=2.841; RMSEA=.071; SRMR=.042; GFI=.911; CFI=.930; NFI=.897; IFI=.931; TLI=.911; AIC=396.022; ECVI=1.079

Figure 5. 28 Path model of the effects of park characteristics on park attachment as mediated via park meaning

Effects of Place Experience on Place attachment as Mediated via Place Meaning

Mediation analyses were conducted for the variables belonging to the cognitive component of the research framework, namely, the place experience, place perception, and place satisfaction domains. In this set of mediation analyses, both the variables indicating the socio-economic background of individuals and the dummy variable indicating the characteristic of physical environment of one's nearby neighborhood park were treated as exogenous variables that have direct effects on the predictor variables, namely the variables from each of the predictive domains, the mediator variable, namely the general park meaning scale indicating resident's level of identification with park meanings, and the outcome variables, namely the three correlated park attachment dimensions. In other words, both the background variables and the place variable were treated as structural factors that have fixed effects on all the three parts of the mediation model. The purpose is to examine that whether the effects of the variables belonging to each predictive domain on park attachment, net of the effects of the structural factors, may decrease substantially or reduce to non-significant subsequent to the introduction of the place meaning scale.

Firstly, the role of park meaning in mediating the relationships between park-based experiences and park attachment was examined. Two sets of mediation analyses were conducted separately for the three park-based activity scales derived from factor analysis and the summative park-based social interaction scale. In the direct effect models (Figure 5. 29, Figure 5. 31), the direct effects of the three park-based activity scales and the park-based social interaction scale on park attachment dimensions were examined, taking into account the effects of the exogenous variables on both the predictor variables and the dependent variables; in the mediational models (Figure 5. 30, Figure 5. 32), the variable indicating level of identification with park meanings was introduced as mediator of the relationships between the park experience variables and park attachment dimensions. As shown in Figure 5. 29 and Figure 5. 30, goodness-of-fit indexes of both the two direct effect models and the two mediational models were well within the acceptable range, indicating a well fit of both models to the data. The detailed parameter estimates are reported in Table 5. 13 - Table 5. 16.

- The Direct Effect Model

It was found that, net of the effects of the structural variables, namely the four socio-economic variables and the park characteristic variable, frequency of passive recreation in neighborhood park was positively related to park caring (Beta=.179, p=.004), park dependence (Beta=.305, p<.001), and park identity (Beta=.289, p<.001), whereas frequency of being with family members in nearby neighborhood park only had significant effect on park caring (Beta=.204, p=.001), and frequency of active recreation had no significant effect on all three attachment dimensions (Table 5. 13).

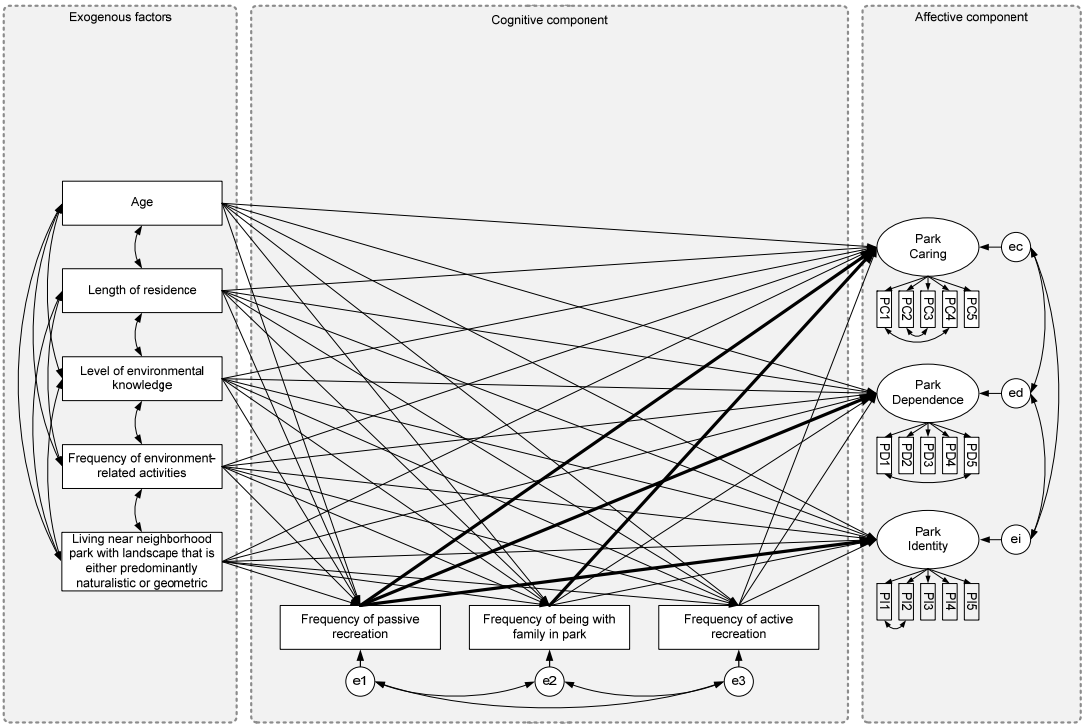
Consistent with the results reported in Figure 5. 17, it was found that frequency of park-based social interaction had significant and positive effects on park caring (Beta=.228, p<.001), park dependence (Beta=.289, p<.001), and park identity (Beta=.300, p<.001) over and above the effects of the exogenous structural variables (Table 5. 15), suggesting that social interactions within neighborhood parks may contribute to the development of emotional tie with the park.

- The Mediational Model

After introducing the general park meaning scale as the mediator, it was found that, net of the effects of the structural factors, passive recreation was the only one among the three predictor variables that had significant direct effect (Beta=.187, p=.001) on the mediator, i.e. identification with park meanings, which was significantly related to all the three attachment dimensions (Table 5. 14). In addition, the previously significant effect of passive recreation on park caring dropped from .179 to .097 and became insignificant (p=.081) and the effects of passive recreation dropped from .305 to .205 (p<.001) for park dependence, and from .289 to .176 (p<.001) for park identity. The results suggest that park meaning was a complete mediator of the relationship between passive recreation and park caring and a partial mediator of the relationships between passive recreation and park dependence and park identity: 45.8% (.187*.438/(.187*.438+.097)) of the total effect of passive recreation on park caring was mediated via identification with park meanings, and the proportion of the total effect of passive recreation that was accounted for by the indirect effect via park meaning was 32.7% (.187*.533/(.187*.533+.205)) for park dependence, and 39.0% (.187*.601/(.187*.601+.176)) for park identity. In other words, why those who have more frequent passive recreation in nearby neighborhood parks tend to care more about the park is probably because that passive recreation experiences had positive effects on one's agreement with the meanings represented by the park, and why passive recreation is positively related to park dependence and park identity may be partly due to its contribution to identification with park meanings which in turn, leads to a stronger functional reliance on park and self-identity in reference to park.

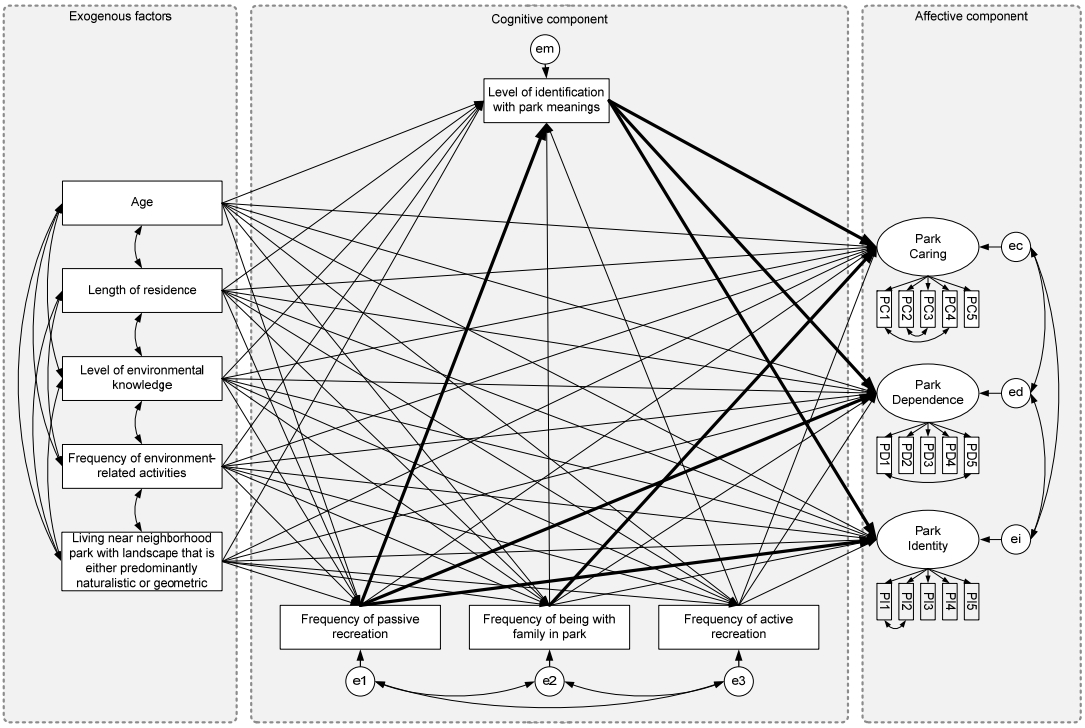
It was also found that the effect of being with family on park caring dropped from .204 to .194 (p=<.001). However, being with family did not have significant effect on the park meaning scale. The results suggest that having activities with family members in nearby neighborhood park may lead to a stronger care for the park but the effect may not be mediated via its influence on park meaning. Finally, it was found that frequency of active recreation had no significant direct effect on park attachment. Nor did any significant indirect effect via park meaning was found.

As to the mediational model for social interaction (Table 5. 16), it was found that, net of the effects of the structural variables, frequency of park-based social interactions had significant direct effect (Beta=.167, p=.002) on identification with park meanings, which was strongly and positively related to all three park attachment dimensions. In addition, the direct effects of social interaction dropped from .228 to .152 (p=.005) for park caring, from .289 to .197 (p<.001) for park dependence, and from .300 to .197 (p<.001) for park identity. In other words, the indirect effects of social interaction on park attachment as mediated via park meaning were .076 (.167*.454) for park caring, .091 (.167*.547) for park dependence, and .102 (.167*.613) for park identity. The results suggest that park meaning was a partial mediator of the relationship between park-based social interaction and park attachment: about 33.3% (.167*.454/(.167*.454+.152)), 31.7% (.167*.547/(.167*.547+.197)), and 34.2% (.167*.613/(.167*.613+.197)) of the total effects of park-based social interaction on park caring, park dependence, and park identity, respectively, were mediated via its contribution to identification with park meanings.



Goodness-of-fit Indexes:
Chi-square=382.024 (df=179); Chi-square/df=2.134; RMSEA=.056; SRMR=.039; GFI=.917; CFI=.935; NFI=.887; IFI=.936; TLI=.908; AIC=576.024; ECVI=1.570

Figure 5. 29 Path model of the direct effects of park activities on park attachment



Goodness-of-fit Indexes:
Chi-square=398.927 (df=191); Chi-square/df=2.089; RMSEA=.054; SRMR=.038; GFI=.916; CFI=.937; NFI=.889; IFI=.939; TLI=.909; AIC=616.927; ECVI=1.681

Figure 5. 30 Path model of the effects of park activities on park attachment as mediated via park meaning

Table 5. 13 Effects of park activities on park attachment - parameter estimates of the direct effect model

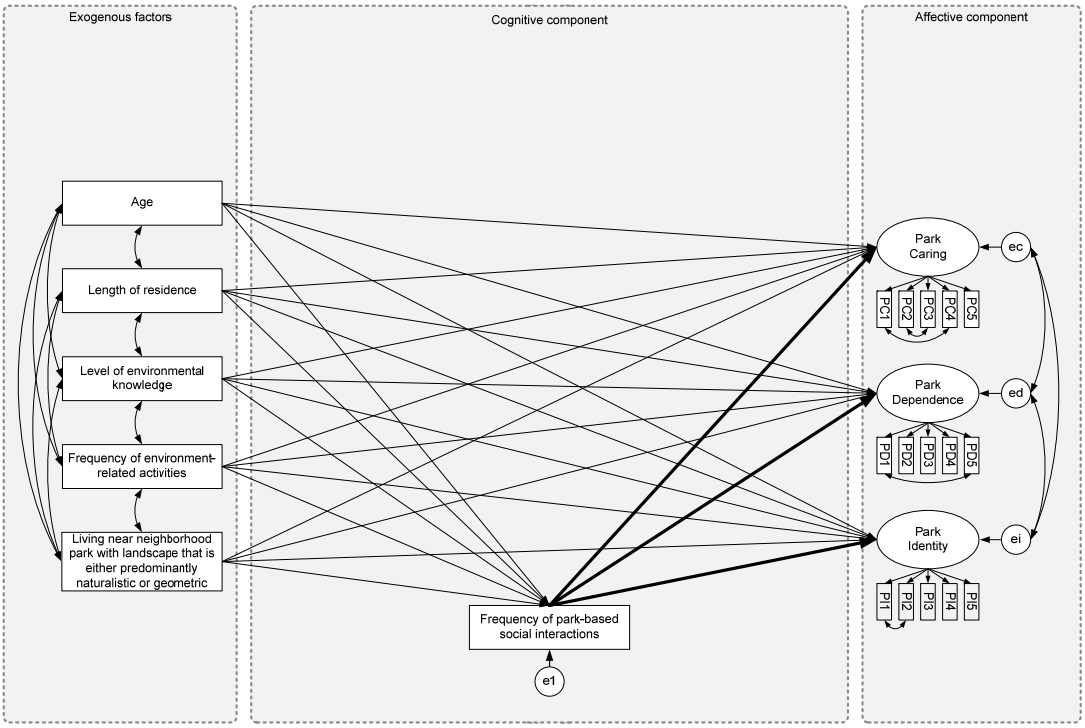
	Dependent Variable					
Independent Variable	Frequency of passive recreation	Frequency of being with family in park	Frequency of active recreation	Park Caring	Park Dependence	Park Identity
Age	.059 .030 (p=.047) [.097]*	.260 .043 (p<.001) [.290]***	-.065 .032 (p=.043) [-.101]*	.067 .024 (p=.006) [.154]**	.084 .028 (p=.003) [.172]**	.074 .026 (p=.004) [.162]**
Length of residence	-.136 .035 (p<.001) [-.189]***	-.224 .050 (p<.001) [-.213]***	-.021 .038 (p=.571) [-.028]	.032 .028 (p=.239) [.064]	.000 .031 (p=.990) [.001]	.024 .029 (p=.417) [.044]
Level of environmental knowledge	.080 .065 (p=.218) [.069]	.236 .093 (p=.011) [.140]*	.040 .070 (p=.569) [.033]	.119 .050 (p=.017) [.147]*	.012 .057 (p=.829) [.013]	.072 .053 (p=.168) [.085]
Frequency of environment-related activity	.320 .066 (p<.001) [.274]***	.298 .095 (p=.002) [.175]**	.349 .072 (p<.001) [.285]***	.087 .053 (p=.101) [.106]	.063 .060 (p=.296) [.068]	.052 .056 (p=.353) [.060]
Living near park with landscape that is either predominantly naturalistic or geometric	-.219 .092 (p=.017) [-.116]*	-.290 .132 (p=.028) [-.105]*	-.065 .099 (p=.513) [-.033]	.255 .073 (p<.001) [.192]***	.261 .081 (p=.001) [.174]**	.259 .075 (p<.001) [.185]***
Frequency of passive recreation				.126 .043 (p=.004) [.179]**	.242 .050 (p<.001) [.305]***	.214 .046 (p<.001) [.289]***
Frequency of being with family in park				.098 .030 (p=.001) [.204]**	-.004 .034 (p=.895) [-.008]	.049 .031 (p=.120) [.096]
Frequency of active recreation				.055 .039 (p=.154) [.082]	.074 .045 (p=.096) [.098]	.044 .041 (p=.282) [.063]
R^2	.16	.19	.11	.27	.16	.22

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 14 Effects of park activities on park attachment - parameter estimates of the mediational effect model

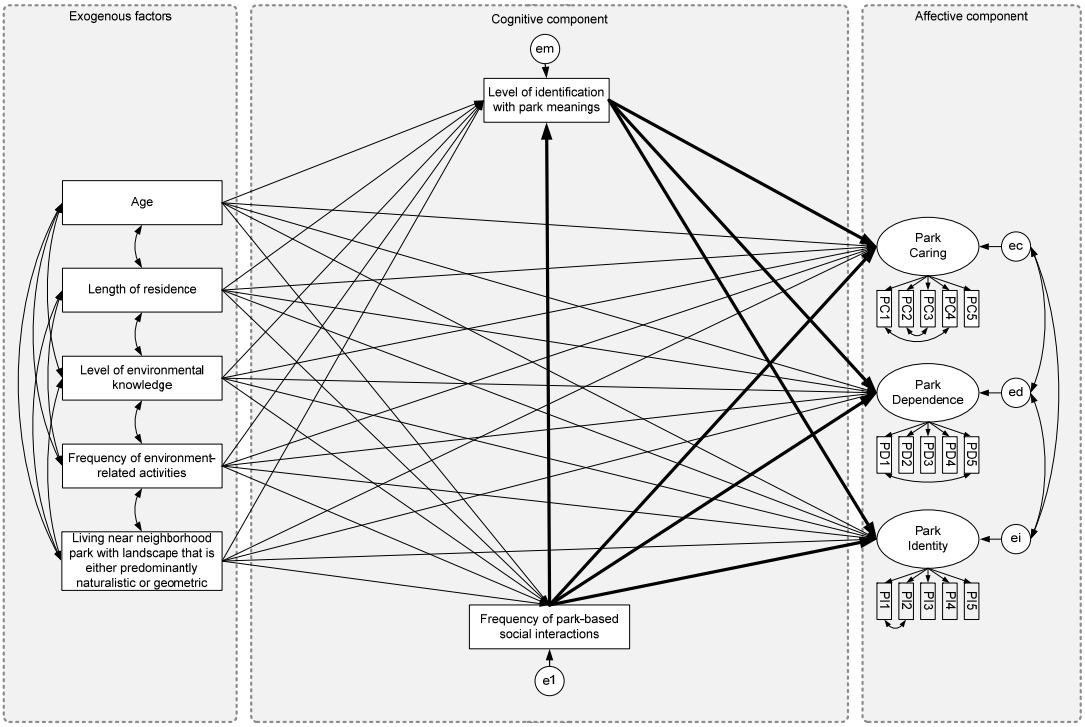
	Dependent Variable						
Independent Variable	Frequency of passive recreation	Frequency of being with family in park	Frequency of active recreation	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.059 .030 (p=.047) [.097]*	.260 .043 (p<.001) [.290]***	-.065 .032 (p=.043) [-.101]*	.062 .022 (p=.005) [.150]**	.038 .022 (p=.083) [.089]	.045 .024 (p=.061) [.093]	.033 .021 (p=.118) [.072]
Length of residence	-.136 .035 (p<.001) [-.189]***	-.224 .050 (p<.001) [-.213]***	-.021 .038 (p=.571) [-.028]	.031 .026 (p=.227) [.063]	.018 .025 (p=.460) [.036]	-.019 .027 (p=.490) [-.033]	.003 .024 (p=.895) [.006]
Level of environmental knowledge	.080 .065 (p=.218) [.069]	.236 .093 (p=.011) [.140]*	.040 .070 (p=.569) [.033]	.071 .046 (p=.121) [.091]	.087 .045 (p=.055) [.107]	-.032 .049 (p=.513) [-.035]	.025 .043 (p=.562) [.029]
Frequency of environment-related activity	.320 .066 (p<.001) [.274]***	.298 .095 (p=.002) [.175]**	.349 .072 (p<.001) [.285]***	.037 .049 (p=.457) [.046]	.071 .048 (p=.142) [.086]	.040 .052 (p=.438) [.044]	.028 .046 (p=.546) [.032]
Living near park with landscape that is either predominantly naturalistic or geometric	-.219 .092 (p=.017) [-.116]*	-.290 .132 (p=.028) [-.105]*	-.065 .099 (p=.513) [-.033]	.094 .065 (p=.149) [.074]	.212 .066 (p=.001) [.160]**	.202 .070 (p=.004) [.135]**	.199 .062 (p=.001) [.140]**
Frequency of passive recreation				.127 .039 (p=.001) [.187]**	.068 .039 (p=.081) [.097]	.163 .043 (p<.001) [.205]***	.132 .038 (p<.001) [.176]***
Frequency of being with family in park				.011 .027 (p=.685) [.024]	.093 .027 (p<.001) [.194]***	-.011 .029 (p=.699) [-.021]	.043 .026 (p=.098) [.084]
Frequency of active recreation				.033 .036 (p=.362) [.051]	.040 .035 (p=.251) [.060]	.054 .038 (p=.163) [.071]	.023 .034 (p=.495) [.032]
Identification with park meanings					.453 .063 (p<.001) [.438]***	.622 .064 (p<.001) [.533]***	.663 .059 (p<.001) [.601]***
R^2	.16	.19	.11	.10	.45	.44	.55

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001



Goodness-of-fit Indexes:
Chi-square=358.471 (df=155); Chi-square/df=2.313; RMSEA=.060; SRMR=.040; GFI=.915; CFI=.930; NFI=.885; IFI=.931; TLI=.905; AIC=510.471; ECVI=1.391

Figure 5. 31 Path model of the direct effects of park-based social interactions on park attachment



Goodness-of-fit Indexes:
Chi-square=374.737 (df=167); Chi-square/df=2.244; RMSEA=.058; SRMR=.039; GFI=.915; CFI=.933; NFI=.887; IFI=.934; TLI=.907; AIC=546.737; ECVI=1.590

Figure 5. 32 Path model of the effects of park-based social interactions on park attachment as mediated via park meaning

Table 5. 15 Effects of park-based social interactions on park attachment - parameter estimates of the direct effect model

	Dependent Variable			
Independent Variable	Frequency of park-based social interactions	Park Caring	Park Dependence	Park Identity
Age	-.068 .027 (p=.011) [-.125]*	.109 .025 (p<.001) [.250]***	.110 .027 (p<.001) [.226]***	.113 .025 (p<.001) [.249]***
Length of residence	-.092 .031 (p=.003) [-.145]**	.009 .028 (p=.750) [.017]	-.009 .031 (p=.773) [-.016]	.006 .029 (p=.836) [.011]
Level of environmental knowledge	-.017 .058 (p=.772) [-.016]	.159 .052 (p=.002) [.194]**	.038 .057 (p=.505) [.041]	.107 .053 (p=.043) [.126]*
Frequency of environment-related activity	.306 .059 (p<.001) [.296]***	.122 .055 (p=.026) [.147]*	.086 .060 (p=154) [.093]	.074 .056 (p=.002) [.085]**
Living near park with landscape that is either predominantly naturalistic or geometric	-.150 .082 (p=.067) [-.090]	.224 .074 (p=002) [.167]**	.243 .082 (p=003) [.162]**	.232 .076 (p=002) [.166]**
Frequency of park-based social interactions		.182 .048 (p<.001) [.228]***	.259 .053 (p<.001) [.289]***	.251 .049 (p<.001) [.300]***
R^2	.15	.22	.16	.19

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 16 Effects of park-based social interactions on park attachment - parameter estimates of the mediational effect model

	Dependent Variable				
Independent Variable	Frequency of park-based social interactions	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	-.068 .027 (p=.011) [-.125]*	.079 .021 (p<.001) [.190]***	.071 .022 (p=.001) [.164]**	.059 .023 (p=.010) [.122]*	.061 .021 (p=.003) [.132]**
Length of residence	-.092 .031 (p=.003) [-.145]**	.022 .025 (p=.375) [.046]	-.002 .025 (p=943) [-.003]	-.023 .027 (p=385) [-.041]	-.009 .024 (p=.688) [-.018]
Level of environmental knowledge	-.017 .058 (p=.772) [-.016]	.088 .046 (p=.057) [.112]	.117 .047 (p=.012) [.143]*	-.018 .049 (p=.716) [-.019]	.049 .044 (p=.262) [.056]
Frequency of environment-related activity	.306 .059 (p<.001) [.296]***	.053 .049 (p=.278) [.067]	.097 .049 (p=.049) [.117]*	.052 .052 (p=.313) [.056]	.038 .046 (p=.401) [.044]
Living near park with landscape that is either predominantly naturalistic or geometric	-.150 .082 (p=.067) [-.090]	.080 .066 (p=220) [.063]	.186 .067 (p=.005) [.139]**	.192 .070 (p=.006) [.128]**	.180 .062 (p=.004) [.127]**
Frequency of park-based social interactions		.128 .042 (p=.002) [.167]**	.121 .043 (p=.005) [.152]**	.177 .046 (p<.001) [.197]***	.167 .040 (p<.001) [.197]***
Identification with park meanings			.474 .064 (p<.001) [.454]***	.639 .064 (p<.001) [.547]***	.678 .059 (p<.001) [.613]***
R^2	.15	.09	.41	.48	.54

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Effect of Place Perception on Place attachment as Mediated via Place Meaning

The fourth set of mediation analyses were conducted to examine the mediating effect of place meaning in the relationship between place perception and place attachment. Specifically, two sets of mediation analyses were conducted for the place perception variables under study, namely the variable indicating residents' preference for the landscape of their own neighborhood park (Figure 5. 33, Figure 5. 34) and the two variables indicating perceived uniqueness of park design features (Figure 5. 35, Figure 5. 36). In these path models, the structural factors, namely the socio-economic variables and the place characteristic variables, were treated as exogenous variables. Goodness-of-fit indexes of the four models were all within acceptable range, indicating a well fit to the data. The detailed parameter estimates are reported in Table 5. 17 to Table 5. 20.

- The Direct Effect Model

As shown in Table 5. 17, controlling for the effects of the structural variables, preference for the landscape of one's own neighborhood park was significantly and positively related to all three attachment dimension, with the largest effect being on park dependence (Beta=.372, p<.001), followed by park identity (Beta=.323,p<.001) and park caring (Beta=.247, p<.001). The results were consistent with that reported in Figure 5. 19: the more residents like the landscape of their own neighborhood park, the stronger their attachment to the park.

Similar findings were also identified for perception of the design elements. As shown in Table 5. 19, net of the effects of the structural factors, perceived uniqueness of park design features was significantly and positively related to all park attachment dimensions. Perceived uniqueness of artificial design elements was strongly related to park dependence (Beta=.244, p<.001), followed by park identity (Beta=.154, p=.013) and park caring (Beta=.130, p=.041), whereas perceived uniqueness of natural design elements was most strongly associated with park identity (Beta=.272, p<.001), followed by park dependence (Beta=.228, p<.001) and park caring (Beta=.156, p=.016). The results were consistent with that reported in Figure 5. 20: uniqueness of natural design elements played a stronger role in contributing to park identity and park caring than did artificial elements, which on the other hand, had stronger effect on park dependence.

- The Mediational Model

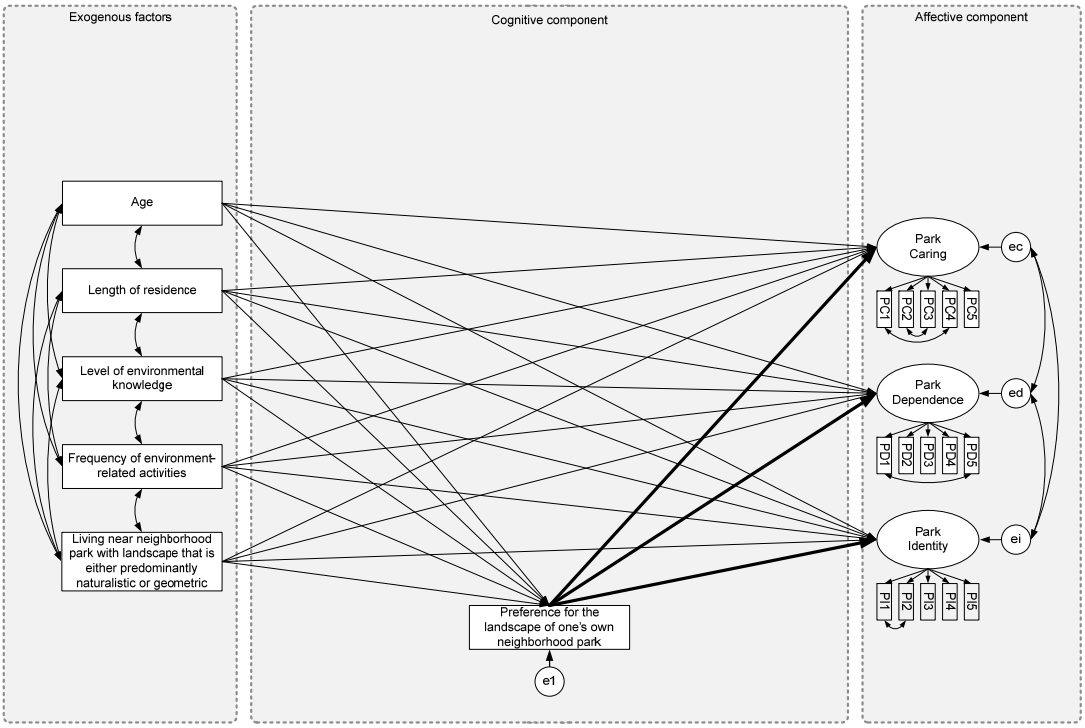
To examine whether the effects of park perception variables on park attachment are mediated via their contributions to park meaning, the scale indicating the level of identification with park meanings was introduced as a mediator variable. As shown in Table 5. 18, net of the effects of the structural factors, preference for one's own park had significant direct effect on park meaning (Beta=.194, p<.001), which was strongly related to all three attachment dimensions. Moreover, the direct effect of preference for one's own park dropped from .247 to .160 (p<.001) for park caring, from .372 to .271 (p<.001) for park dependence, and from .323 to .207 (p<.001) for park identity. The results suggest that park meaning is a partial mediator of the relationship between preference for one's own park and park attachment: 35.1% (.194*.446/(.194*.446+.160)) of the total effect of preference for one's own park on park caring was mediated via park meaning, and 27.3% (.194*.524/(.194*.524+.271)) and 36.1%

(.194*.603/(.194*.603+.207)) of the total effects on park dependence and park identity, respectively, were accounted for by the indirect effects. In other words, the findings suggest that why those who like the landscape of their own neighborhood park tend to have stronger attachment to the park may be partly due to the positive effect of their preference on identification with the meanings represented by the park, which consequently, leads to a positive emotional tie with the park.

The mediating effect of park meaning was also identified for perception of park design features. As shown in Table 5. 20, controlling for the effects of the structural factors, perceived uniqueness of both artificial (Beta=.196, p<.001) and natural (Beta=.201, p<.001) park design features had significant direct effects on park meaning, which was strongly related to all three attachment dimensions. As for perceived uniqueness of artificial design features, its direct effect on park caring dropped from the previously significant .130 to a non-significant .043 (p=.464). So did its direct effect on park identity, which dropped from .154 to .039 (p=.460). However, its direct effect on park dependence remained significant but decreased from .244 to .146 (p=.008). The results suggest that identification with park meanings was a complete mediator of the relationship between artificial elements and park caring and park identity, and it mediated more indirect effect for park identity (.196*.587/(.196*.587+.039)=74.7%) than for park caring (.196*.446/(.196*.446+.043)=67.0%). On the other hand, park meaning was a partial mediator for park dependence: about 40% (.196*.497/(.196*.497+.146)) of the total effect of uniqueness of artificial features on park dependence was mediated via identification with park meanings.

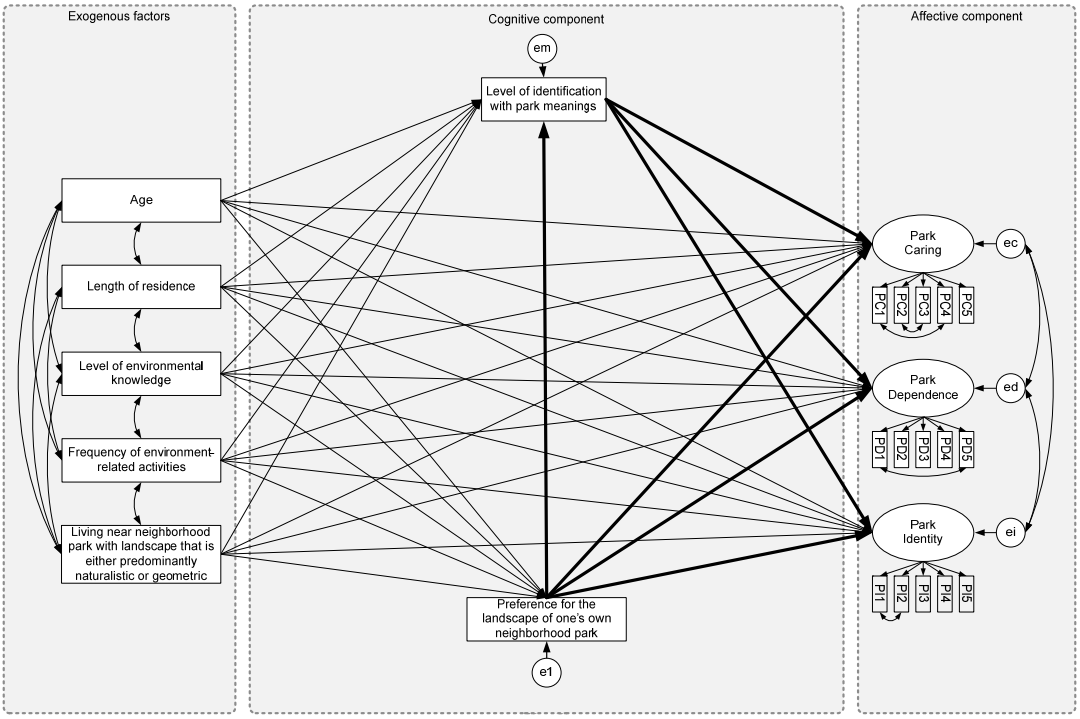
As with artificial elements, the direct effect of perceived uniqueness of natural design feature on park caring dropped from .156 to a non-significant .067 (p=.261). However, its effects on park dependence (Beta=.129, p=.021) and park identity (Beta=.154, p=.004) remained significant though decreased. The results suggest that park meaning was a complete mediator of the relationship between perceived uniqueness of natural design features and park caring: about 57.2% (.201*.446/(.201*.446+.067)) of the total effect was mediated via park meaning. On the other hand, park meaning was a partial mediator for park dependence and park identity, and it mediated slightly more indirect effect for the former (.201*.497/(.201*.497+.129)=43.6%) than for the latter (.201*.587/(.201*.587+.154)=43.4%).

To sum up, identification with park meanings was found to be a partial mediator of the relationship between preference for the landscape of one's own park and all three park attachment dimensions, and it mediated more indirect effect on park identity than that on park caring and park dependence. It was also found that park meaning was a complete mediator of the relationships between perceived uniqueness of both artificial and natural design features and park caring, and it mediated more indirect effect for artificial elements than for natural elements. Park meaning was also a partial mediator of the relationships between both types of design features and park dependence, and it mediated more indirect effect for natural features than for artificial features. In addition, park meaning mediated completely the effect of uniqueness of artificial features on park identity but only partially the effect of uniqueness of natural features.



Goodness-of-fit Indexes:
Chi-square=366.995 (df=155); Chi-square/df=2.368; RMSEA=.061; SRMR=.041; GFI=.912; CFI=.927; NFI=.882; IFI=.928; TLI=.901; AIC=518.995; ECVI=1.414

Figure 5. 33 Path model of the direct effect of preference for one's own park on park attachment



Goodness-of-fit Indexes:
Chi-square=383.325 (df=167); Chi-square/df=2.295; RMSEA=.059; SRMR=.040; GFI=.912; CFI=.930; NFI=.885; IFI=.931; TLI=.903; AIC=555.325; ECVI=1.513

Figure 5. 34 Path model of the effect of preference for one's own park on park attachment as mediated via park meaning

Table 5. 17 Effects of preference for one's own park on park attachment - parameter estimates of the direct effect model

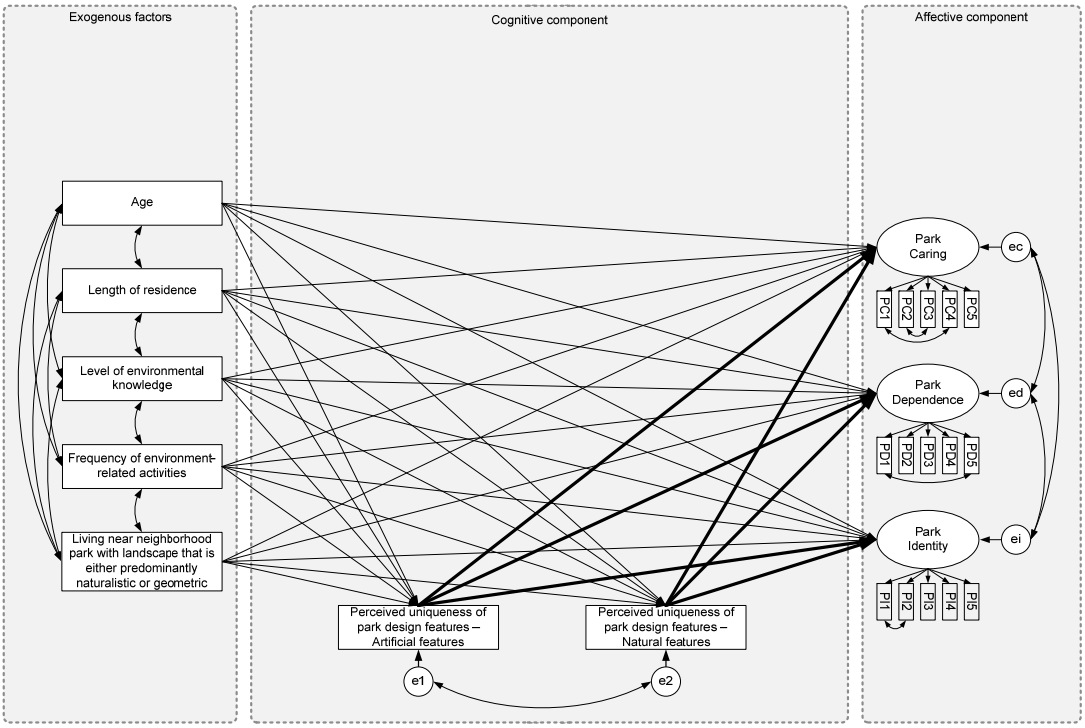
	Dependent Variable			
Independent Variable	Preference for the landscape of one's own neighborhood park	Park Caring	Park Dependence	Park Identity
Age	.102 .036 (p=.005) [.146]**	.081 .024 (p<.001) [.186]***	.066 .026 (p=.011) [.135]*	.075 .025 (p=.002) [.164]**
Length of residence	.017 .042 (p=.689) [.021]	-.011 .027 (p=697) [-.021]	-.038 .030 (p=.211) [-.066]	-.021 .028 (p=.458) [-.039]
Level of environmental knowledge	.155 .078 (p=.046) [.119]*	.132 .051 (p=.010) [.161]*	-.007 .056 (p=.898) [-.008]	.070 .053 (p=.184) [.082]
Frequency of environment-related activity	.148 .080 (p=.063) [.112]	.155 .053 (p=.004) [.187]**	.127 .057 (p=.027) [.137]*	.119 .054 (p=.027) [.138]*
Living near park with landscape that is either predominantly naturalistic or geometric	.195 .110 (p=.078) [.091]	.166 .072 (p=.022) [.124]*	.154 .079 (p=.052) [.102]	.154 .074 (p=.039) [.109]*
Preference for the landscape of one's own neighborhood park		.154 .036 (p<.001) [.247]***	.262 .040 (p<.001) [.372]***	.211 .037 (p<.001) [.323]***
R^2	.06	.23	.22	.21

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 18 Effects of preference for one's own park on park attachment - parameter estimates of the mediational effect model

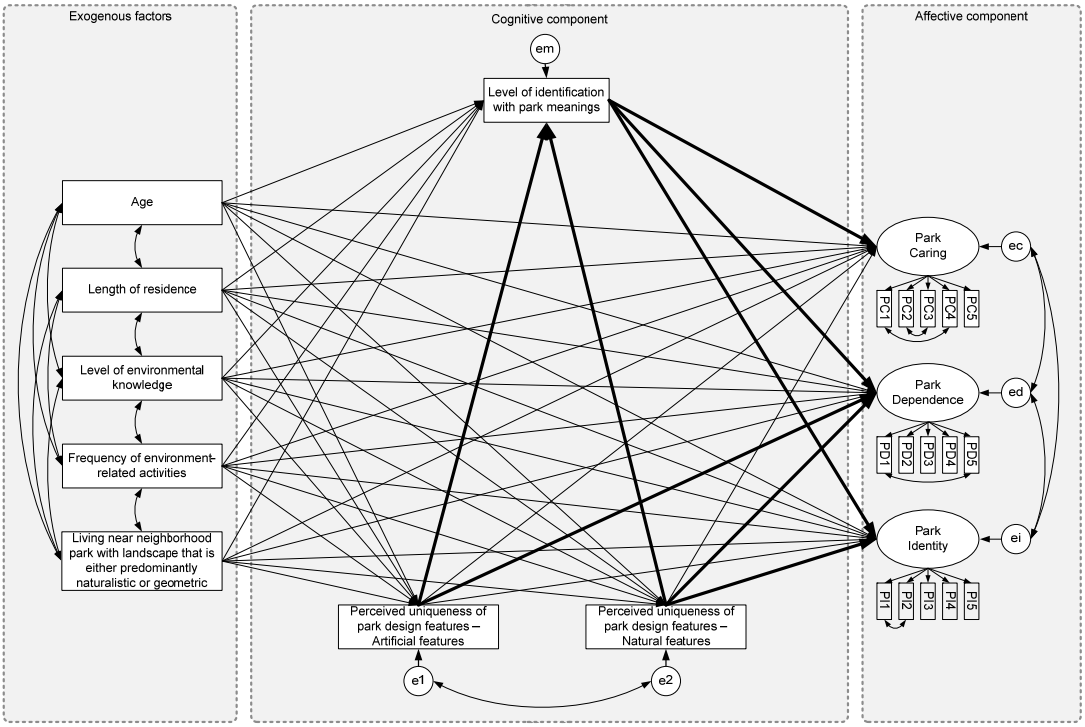
	Dependent Variable				
Independent Variable	Preference for the landscape of one's own neighborhood park	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.102 .036 (p=.005) [.146]**	.059 .021 (p=.006) [.141]**	.053 .022 (p=.014) [.123]*	.030 .023 (p=.183) [.061]	.037 .020 (p=.070) [.080]
Length of residence	.017 .042 (p=.689) [.021]	.009 .025 (p=.730) [.018]	-.015 .025 (p=.554) [-.029]	-.043 .026 (p=099) [-.075]	-.027 .023 (p=.242) [-.050]
Level of environmental knowledge	.155 .078 (p=.046) [.119]*	.067 .046 (p=.142) [.086]	.100 .046 (p=.031) [.123]*	-.048 .048 (p=.316) [-.053]	.025 .043 (p=.563) [.029]
Frequency of environment-related activity	.148 .080 (p=.063) [.112]	.075 .047 (p=.111) [.094]	.120 .048 (p=.013) [.145]*	.081 .050 (p=.101) [.087]	.071 .044 (p=.111) [.081]
Living near park with landscape that is either predominantly naturalistic or geometric	.195 .110 (p=.078) [.091]	.038 .065 (p=.555) [.030]	.149 .066 (p=.024) [.111]*	.131 .068 (p=.056) [.087]	.129 .061 (p=.035) [.091]*
Preference for the landscape of one's own neighborhood park		.116 .031 (p<.001) [.194]***	.100 .032 (p<.001) [.160]***	.191 .035 (p<.001) [.271]***	.137 .030 (p<.001) [.207]***
Identification with park meanings			.466 .064 (p<.001) [.446]***	.616 .063 (p<.001) [.524]***	.667 .059 (p<.001) [.603]***
R^2	.06	.10	.41	.46	.54

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001



Goodness-of-fit Indexes:
Chi-square=363.388 (df=167); Chi-square/df=2.176; RMSEA=.057; SRMR=.038; GFI=.918; CFI=.935; NFI=.889; IFI=.937; TLI=.911; AIC=535.388; ECVI=1.459

Figure 5. 35 Path model of the direct effect of perceived uniqueness of park design features on park attachment



Goodness-of-fit Indexes:
Chi-square=379.451 (df=179); Chi-square/df=2.120; RMSEA=.055; SRMR=.037; GFI=.918; CFI=.938; NFI=.891; IFI=.939; TLI=.912; AIC=573.451; ECVI=1.563

Figure 5. 36 Path model of the effect of perceived uniqueness of park design features on park attachment as mediated via park meaning

Table 5. 19 Effects of perceived uniqueness of park design features on park attachment - parameter estimates of the direct effect model

	Dependent Variable				
Independent Variable	Perceived uniqueness of park design features – Artificial elements	Perceived uniqueness of park design features – Natural elements	Park Caring	Park Dependence	Park Identity
Age	.022 .032 (p=.502) [.034]	.030 .029 (p=.308) [.052]	.091 .024 (p<.001) [.210]***	.083 .025 (p=.001) [.170]**	.087 .024 (p=<.001) [.192]***
Length of residence	.000 .038 (p=.994) [.000]	.026 .035 (p=.460) [.038]	-.011 .027 (p=.685) [-.022]	-.038 .030 (p=.210) [-.066]	-.023 .028 (p=.411) [-.043]
Level of environmental knowledge	.058 .070 (p=.409) [.049]	.080 .064 (p=.212) [.073]	.141 .051 (p=.006) [.173]**	.008 .055 (p=889) [.008]	.079 .052 (p=.126) [.092]
Frequency of environment-related activity	.302 .072 (p<.001) [.250]***	.243 .065 (p<.001) [.220]***	.121 .054 (p=.024) [.148]*	.062 .057 (p=.280) [.067]	.065 .054 (p=.225) [.076]
Living near park with landscape that is either predominantly naturalistic or geometric	.246 .100 (p=.014) [.126]*	.335 .090 (p<.001) [.188]***	.135 .073 (p=.064) [.101]	.094 .079 (p=.232) [.063]	.096 .074 (p=195) [.069]
Perceived uniqueness of park design features – Artificial features			.089 .043 (p=.041) [.130]*	.187 .048 (p<.001) [.244]***	.110 .044 (p=.013) [.154]*
Perceived uniqueness of park design features – Natural features			.116 .048 (p=.016) [.156]*	.192 .052 (p<.001) [.228]***	.213 .050 (p<.001) [.272]***
R^2	.08	.09	.23	.24	.24

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 20 Effects of perceived uniqueness of park design features on park attachment - parameter estimates of the mediational effect model

	Dependent Variable					
Independent Variable	Perceived uniqueness of park design features – Artificial elements	Perceived uniqueness of park design features – Natural elements	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.022 .032 (p=.502) [.034]	.030 .029 (p=.308) [.052]	.064 .020(p=.002) [.152]**	.061 .022 (p=.005) [.142]**	.046 .023 (p=.043) [.094]*	.047 .020 (p=.020) [.103]*
Length of residence	.000 .038 (p=.994) [.000]	.026 .035 (p=.460) [.038]	.007 .024 (p=.775) [.014]	-.014 .025 (p=.569) [-.028]	-042 .026 (p=.112) [-.073]	-.028 .023 (p=.236) [-.052]
Level of environmental knowledge	.058 .070 (p=.409) [.049]	.080 .064 (p=.212) [.073]	.066 .044 (p=130) [.085]	.110 .047 (p=.018) [.135]*	-.031 .048 (p=.525) [-.034]	.036 .044 (p=.406) [.042]
Frequency of environment-related activity	.302 .072 (p<.001) [.250]***	.243 .065 (p<.001) [.220]***	.018 .046 (p=.694) [.023]	.113 .049 (p=.021) [.137]*	.051 .051 (p=.311) [.056]	.054 .046 (p=.234) [.062]
Living near park with landscape that is either predominantly naturalistic or geometric	.246 .100 (p=.014) [.126]*	.335 .090 (p<.001) [.188]***	-.019 .063 (p=.765) [-.015]	.144 .067 (p=.032) [.108]*	.105 .070 (p=.131) [.070]	.109 .063 (p=.082) [.077]
Perceived uniqueness of park design features – Artificial features			.129 .038 (p<.001) [.196]***	.029 .040 (p=.464) [.043]	.112 .042 (p=.008) [.146]**	.028 .038 (p=.460) [.039]
Perceived uniqueness of park design features – Natural features			.144 .041 (p<.001) [.201]***	.050 .044 (p=.261) [.067]	.108 .047 (p=.021) [.129]*	.122 .042 (p=.004) [.154]**
Identification with park meanings				.462 .066 (p<.001) [.446]***	.581 .065 (p<.001) [.497]***	.646 .061 (p<.001) [.587]***
R^2	.08	.09	.17	.40	.44	.53

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Effects of Place Satisfaction on Place attachment as Mediated via Place Meaning

The last set of mediation analyses were conducted to examine the mediating effect of place meaning in the relationship between place satisfaction and place attachment. Specifically, two sets of models were constructed for the place satisfaction variables, namely the two park quality evaluation scales and the general park satisfaction scale. As shown in Figure 5. 37 to Figure 5. 40, all four models achieved adequate fit to the sample data. The detailed parameter estimates are reported in Table 5. 21 to Table 5. 24.

- The Direct Effect Model

As shown in Table 5. 21, the results were consistent with that reported in Figure 5. 21: net of the effects of the structural factors, the perceived natural quality of neighborhood park had significant direct effects on all three park attachment dimensions, with the effect on park dependence being the strongest (Beta=.483, p<.001), followed by park identity (Beta=.446, p<.001) and park caring (Beta=.306, p<.001), whereas the perceived orientation and comfort quality was not significantly related to any attachment dimension. General park satisfaction was also found having significant direct effect on park attachment (Table 5. 23), net of the effects of the structural factors, with the effect on park identity being the strongest (Beta=.445, p<.001), followed by park dependence (Beta=.434, p<.001) and park caring (Beta=.314, p<.001), which were consistent with the results reported in Figure 5. 22.

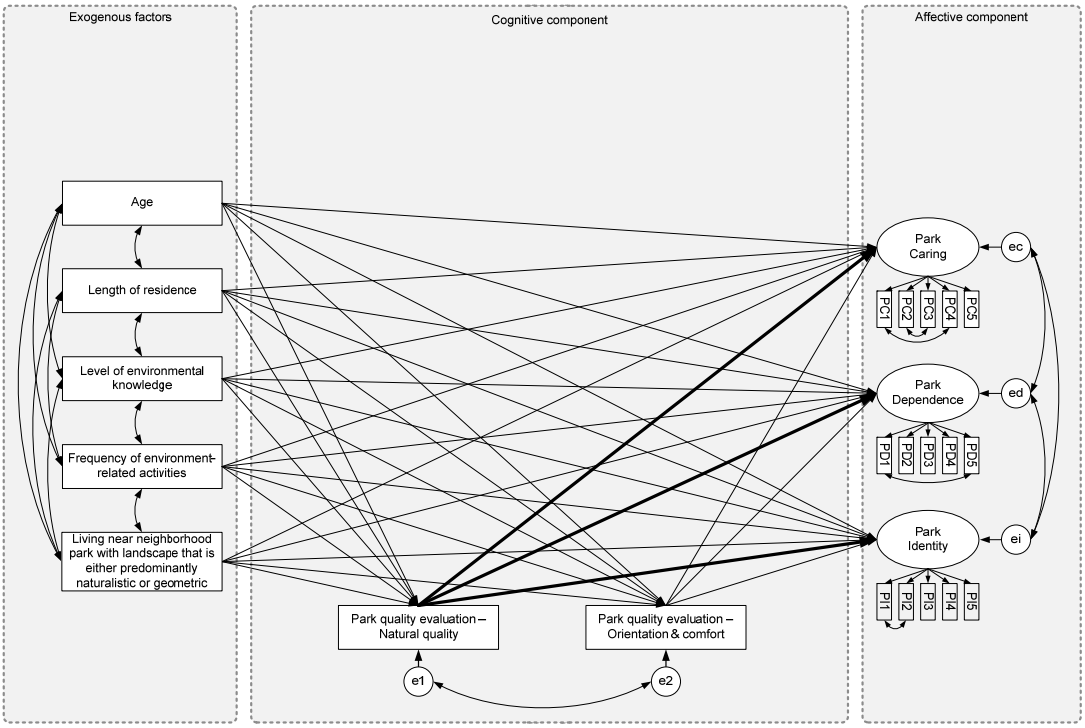
- The Mediational Model

It was found that in the mediational model for park quality evaluation variables (Table 5. 22), perceived natural quality had significant direct effect on identification with park meanings (Beta=.359, p<.001), which was strongly related to all three park attachment dimensions. In addition, the previously significant direct effects of natural quality on park attachment dimensions all decreased, with the effect dropped from .306 to .162 (p=.006) for park caring, from .483 to .314 (p<.001) for park dependence, and from .446 to .253 (p<.001) for park identity. These results suggested that park meaning was a partial mediator of the relationship between perceived natural quality of neighborhood park and park attachment: and it mediated more indirect effect for park caring (.359*.402/(.359*.402+.162)=47.1%) than for park dependence (.359*.471/(.359*.471+.314)=35%) and park identity (.359*.538/(.359*.538+.253)=43,3%). In other words, the positive effect of natural quality on park attachment was partly due to its contribution to identification with park meanings.

It was also found that perceived orientation and comfort quality of neighborhood park had significant direct effect on park meaning and its effects on park attachment dimensions were not significant, suggesting a total mediating effect of the park meaning scale. However, since no significant direct effect was identified at the first place in the direct effect model, the results implied that there might be other mediators not included in this model that produced contrary effects, thus resulting in a nonsignificant total effect (Frazier, et al., 2004, p. 126).

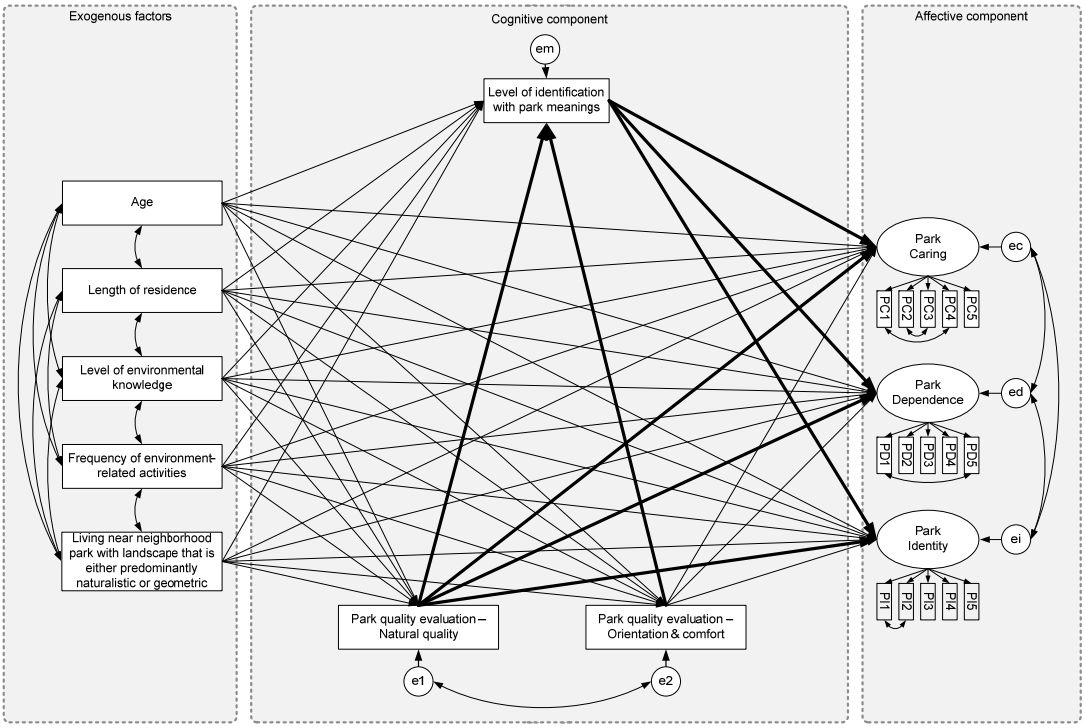
As to the mediation model for the general park satisfaction scale, it was found that, net of the effects of the exogenous variables, positive evaluation of the general quality of neighborhood park had significant direct effect on identification with park meanings (Beta=.461, p<.001),

which was a strong contributor to park attachment. Moreover, the previously significant direct effects of general park satisfaction on park attachment dimensions all decreased, with the effect dropped from .314 to .120 ($p=.032$) for park caring, from .434 to .214 ($p<.001$) for park dependence, and .445 to .189 ($p<.001$) for park identity. The results suggested that identification with park meanings was a partial mediator of the relationship between park satisfaction and park attachment, and it mediated more indirect effect for park caring (.461*.421/(.461*.421+.120)=61.8%) than for park dependence (.461*.476/(.461*.476+.214)=50.6%) and park identity (.461*.554/(.461*.554+.189)=57.5%). In other words, the results suggested that the positive effect of place satisfaction on place attachment may be partly due to its contribution to identification with the meanings attributed to the place, which in turn leads to a positive emotional bond with the place.



Goodness-of-fit Indexes:
Chi-square=385.742 (df=167); Chi-square/df=2.310; RMSEA=.060; SRMR=.041; GFI=.912; CFI=.928; NFI=.882; IFI=.929; TLI=.900; AIC=557.742; ECVI=1.520

Figure 5. 37 Path model of the direct effect of park quality evaluation on park attachment



Goodness-of-fit Indexes:
Chi-square=406.871 (df=179); Chi-square/df=2.273; RMSEA=.059; SRMR=.040; GFI=.911; CFI=.930; NFI=.884; IFI=.931; TLI=.901; AIC=600.871; ECVI=1.637

Figure 5. 38 Path model of the effect of park quality evaluation on park attachment as mediated via park meaning

Table 5. 21 Effect of park quality evaluation on park attachment - parameter estimates of the direct effect model

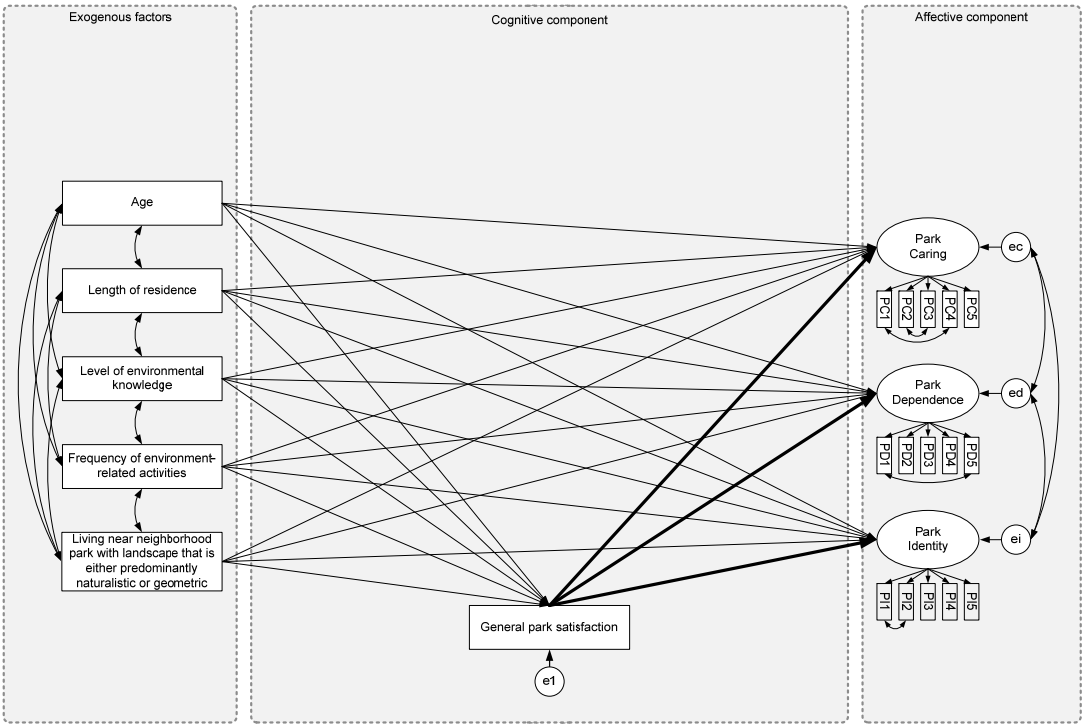
	Dependent Variable				
Independent Variable	Park quality evaluation – Natural quality	Park quality evaluation – Orientation and comfort	Park Caring	Park Dependence	Park Identity
Age	.057 .030 (p=.057) [.100]	.085 .036 (p=.016) [.125]*	.079 .023 (p<.001) [.183]***	.071 .025 (p=.004) [.146]**	.073 .023 (p=.002) [.159]**
Length of residence	.003 .035 (p=.943) [.004]	.055 .042 (p=.191) [.068]	-.011 .026 (p=.677) [-.022]	-.032 .029 (p=.258) [-.057]	-.021 .027 (p=.436) [-.039]
Level of environmental knowledge	-.009 .065 (p=.895) [-.008]	.089 .077 (p=.247) [.070]	.153 .050 (p=.002) [.188]**	.039 .053 (p=.459) [.043]	.101 .049 (p=.040) [.118]*
Frequency of environment-related activity	.148 .067 (p=.027) [.135]*	.122 .079 (p=.124) [.094]	.137 .051 (p=.008) [.166]**	.108 .055 (p=.048) [.117]*	.095 .051 (p=.061) [.109]
Living near park with landscape that is either predominantly naturalistic or geometric	.178 .093 (p=.055) [.101]	-.002 .110 (p=.989) [-.001]	.155 .070 (p=.027) [.116]*	.131 .076 (p=.083) [.087]	.133 .070 (p=.058) [.094]
Park quality evaluation – Natural quality			.231 .048 (p<.001) [.306]***	.410 .052 (p<.001) [.483]***	.355 .047 (p<.001) [.446]***
Park quality evaluation – Orientation and comfort			.045 .037 (p=.217) [.071]	-.027 .040 (p=.504) [-.037]	.038 .037 (p=.304) [.057]
R^2	.03	.04	.29	.30	.33

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 22 Effect of park quality evaluation on park attachment - parameter estimates of the mediational effect model

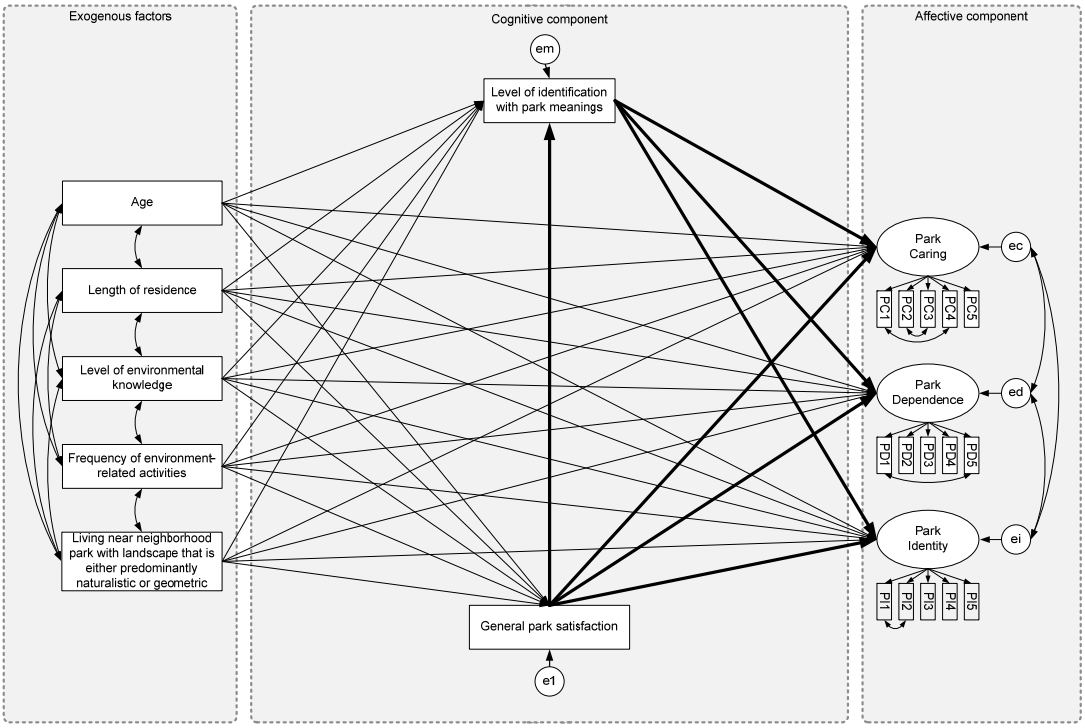
	Dependent Variable					
Independent Variable	Park quality evaluation – Natural quality	Park quality evaluation – Orientation and comfort	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.057 .030 (p=.057) [.100]	.085 .036 (p=.016) [.125]*	.049 .019 (p=.012) [.117]*	.059 .022 (p=.006) [.136]**	.045 .022 (p=.046) [.091]*	.045 .020 (p=.026) [.097]*
Length of residence	.003 .035 (p=.943) [.004]	.055 .042 (p=.191) [.068]	.005 .023(p=.811) [.011]	-.013 .025 (p=.590) [-.026]	-.035 .026 (p=.172) [-.062]	-.024 .023 (p=.294) [-.045]
Level of environmental knowledge	-.009 .065 (p=.895) [-.008]	.089 .077 (p=.247) [.070]	.080 .042 (p=.055) [.103]	.119 .046 (p=.010) [.147]*	-.005 .048 (p=.920) [-.005]	.055 .043 (p=.206) [.063]
Frequency of environment-related activity	.148 .067 (p=.027) [.135]*	.122 .079 (p=.124) [.094]	.044 .043 (p=.309) [.055]	.118 .048 (p=.013) [.144]*	.084 .049 (p=.088) [.091]	.069 .044 (p=.116) [.079]
Living near park with landscape that is either predominantly naturalistic or geometric	.178 .093 (p=.055) [.101]	-.002 .110 (p=.989) [-.001]	.015 .060 (p=.803) [.012]	.149 .065 (p=.023) [.112]*	.123 .068 (p=.070) [.082]	.124 .061 (p=.041) [.088]*
Park quality evaluation – Natural quality			.260 .037 (p<.001) [.359]***	.122 .045 (p=.006) [.162]**	.266 .047 (p<.001) [.314]***	.203 .042 (p<.001) [.253]***
Park quality evaluation – Orientation and comfort			.081 .032 (p=.010) [.133]*	.011 .034 (p=.739) [.018]	-.071 .036 (p=.050) [-.100]	-.010 .032 (p=.754) [-.015]
Identification with park meanings				.417 .066 (p<.001) [.402]***	.550 .066 (p<.001) [.471]***	.595 .061 (p<.001) [.538]***
R^2	.03	.04	.25	.41	.46	.55

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001



Goodness-of-fit Indexes:
Chi-square=365.456 (df=155); Chi-square/df=2.358; RMSEA=.061; SRMR=.041; GFI=.912; CFI=.928; NFI=.883; IFI=.929; TLI=.902; AIC=517.456; ECVI=1.410

Figure 5. 39 Path model of the direct effect of general park satisfaction on park attachment



Goodness-of-fit Indexes:
Chi-square=388.567 (df=167); Chi-square/df=2.327; RMSEA=.060; SRMR=.040; GFI=.911; CFI=.930; NFI=.885; IFI=.931; TLI=.903; AIC=560.567; ECVI=1.527

Figure 5. 40 Path model of the effect of general park satisfaction on park attachment as mediated via park meaning

Table 5. 23 Effect of general park satisfaction on park attachment - parameter estimates of the direct effect model

	Dependent Variable			
Independent Variable	General park satisfaction	Park Caring	Park Dependence	Park Identity
Age	.067 .023 (p=.004) [.150]***	.076 .024 (p=.001) [.175]**	.061 .025 (p=.016) [.124]*	.066 .023 (p=.005) [.144]**
Length of residence	.009 .027 (p=.730) [.018]	-.011 .027 (p=.681) [-.021]	-.038 .029 (p=.200) [-.065]	-.022 .027 (p=.416) [-.041]
Level of environmental knowledge	.044 .050 (p=.381) [.053]	.142 .050 (p=.005) [.174]**	.012 .054 (p=.818) [.014]	.082 .050 (p=.102) [.096]
Frequency of environment-related activity	.093 .051 (p=.071) [.110]	.149 .052 (p=.004) [.180]**	.122 .056 (p=.029) [.131]*	.109 .051 (p=.033) [.126]*
Living near park with landscape that is either predominantly naturalistic or geometric	.132 .071 (p=.064) [.096]	.156 .071 (p=..029) [.116]*	.142 .077 (p=.067) [.094]	.135 .071 (p=.057) [.096]
General park satisfaction		.307 .057 (p<.001) [.314]***	.478 .062 (p<.001) [.434]***	.457 .057 (p<.001) [.445]***
R^2	.05	.27	.26	.31

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

Table 5. 24 Effect of general park satisfaction on park attachment - parameter estimates of the mediational effect model

	Dependent Variable				
Independent Variable	General park satisfaction	Identification with park meanings	Park Caring	Park Dependence	Park Identity
Age	.067 .023 (p=.004) [.150]***	.042 .019 (p=.029) [.100]*	.058 .022 (p=.008) [.132]**	.038 .023 (p=.100) [.077]	.041 .020 (p=.044) [.089]*
Length of residence	.009 .027 (p=.730) [.018]	.006 .022 (p=.772) [.013]	-.014 .025 (p=.579) [-.027]	-.041 .027 (p=.121) [-.072]	-.026 .023 (p=.264) [-.049]
Level of environmental knowledge	.044 .050 (p=.381) [.053]	.066 .041 (p=.108) [.085]	.113 .047 (p=.016) [.138]*	-.024 .049 (p=.619) [-.027]	.042 .044 (p=.335) [.049]
Frequency of environment-related activity	.093 .051 (p=.071) [.110]	.052 .042 (p=.220) [.066]	.126 .048 (p=.009) [.153]**	.093 .050 (p=.066) [.100]	.078 .045 (p=.081) [.089]
Living near park with landscape that is either predominantly naturalistic or geometric	.132 .071 (p=.064) [.096]	.004 .059 (p=.945) [.003]	.154 .066 (p=.020) [.115]*	.139 .070 (p=.046) [.093]*	.133 .062 (p=.031) [.094]*
General park satisfaction		.433 .043 (p<.001) [.461]***	.118 .055 (p=.032) [.120]*	.236 .059 (p<.001) [.214]***	.196 .052 (p<.001) [.189]***
Identification with park meanings			.439 .068 (p<.001) [.421]***	.558 .068 (p<.001) [.476]***	.612 .063 (p<.001) [.554]***
R^2	.05	.27	.40	.43	.53

Note: The first number is the unstandardized coefficient, followed by the standard error and p value. Standardized coefficients are in square brackets.
*p<0.05; **p<0.01; ***p<0.001

5.3. Examining the Impacts of Place Attachment

What might be the impacts of place attachment? As suggested in literature, the emotional bond between people and a specific place may not be an end in itself but have significant consequent influences on people's attitudes and behaviors relevant to that place. The third part of this chapter explores the behavioral implications of place attachment.

Defining Attachment Groups

K-Means cluster analysis was conducted to classify respondents into homogeneous groups based on their scores on park caring, park dependence, and park identity. A three-cluster solution was imposed, resulting in three groups representing low, median, and high level of park attachment, respectively. An accompanying one-way ANOVA analysis indicated that there were significant differences between each pair of groups with regard to the scores on each of the park attachment dimensions (Table 5. 25).

The decision to adopt cluster analysis and one-way ANOVA rather than path analysis to examine the impacts of park attachment was also based on the fact that the three latent variables representing the three park attachment dimensions were highly correlated with each other as shown in the confirmed measurement model (Figure 5. 7). Therefore, the interpretation of the parameter estimates of the path model, in which the three latent variables representing attachment dimensions are treated as independent variables and the attitudinal and behavioral scales are treated as dependent variables, might be problematic due to collinearity issue. In addition, it was also based on the consideration that the main objective of this section is to conduct a preliminary examination of the attitudinal and behavioral implications of place attachment in general, rather than investigating the differences of the impacts across the place attachment dimensions.

Table 5. 25 ANOVA – Differences of attachment levels between attachment groups derived from cluster analysis

	Park Attachment Group				
Park Attachment Dimension	Low (n=79)	Medium (n=206)	High (n=83)	F	Sig
Park Caring	2.32	3.16	3.98	277.411	0.001
Park Dependence	1.99	2.88	3,80	325.223	0.001
Park Identity	2.08	3.00	4.01	545.869	0.001

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Effect of Park Attachment on Park-related Attitudes and Behaviors

To examine Hypothesis 3a, which concerns the impacts of place attachment on place-related attitudes and behaviors, one-way analysis of variance was conducted for the seven park upgrade proposal preference scales, the two scales indicating residents' behavioral intensions when facing negative park changes, and the summative scale indicating residents' willingness to participate in park-related activities. The results (Table 5. 26) show that six out of the ten attitude and behavior scales were found to be significantly associated with level of park attachment. For those upgrade proposal scales whose mean ratings did not vary significantly across the three attachment groups, positive relationships with park attachment were still identifiable, which means that as park attachment goes towards positive, so did the support for these upgrade

proposals.

Among the seven park upgrade preference scales, three were significantly related to park attachment but the direction of relationships varied. Post hoc tests indicated that the high attachment group expressed significantly greater support for naturalistic landscape than did the medium and low attachment groups, the ratings of this item of the latter two groups, on the other hand, did not differ significantly. The results suggested that the stronger residents' attachment to their own neighborhood park, the more likely they will favor design and management strategies that create and maintain a naturalistic landscape, such as plant trees in natural ways as in the forest, let plants grow naturally to create an organic landscape, replant empty park land with dense vegetation, and grow more flower trees and shrubs. The results also indicated that park attachment only accounted for a very small proportion (R^2=.037) of the variance in supporting naturalistic landscape.

Similarly, post hoc tests revealed that the high attachment group was significantly more supportive of human interventions in the park than did the other two groups, suggesting that the more residents feel emotionally attached to their own neighborhood park, the more likely they will support design and management strategies that exhibit clear signs of human interventions to the park environment, such as cutting overgrown plants to allow people to see through the woods, trimming lawns and shrubs along the paths regularly, arranging shrubs and flowerbeds in geometric patterns, and enforcing strict regulations on litter and vandalism. Only a marginal amount of the variance in supporting human interventions was accounted for by park attachment (R^2=.027).

The results also indicated that the high attachment group showed significantly stronger negative opinion towards the proposal to add commercial facilities, such as groceries store and coffee shop, in neighborhood park than did the other two attachment groups, suggesting that local commercial development might be regarded as incompatible with the environment of nearby neighborhood park and thus a potential threat to the emotional tie with the park. However, park attachment only accounted for 1.8% of the variance in opposing commercial facilities.

Significant differences regarding behavioral intentions when facing negative park changes were also identified across attachment groups: post hoc tests indicated that the high and medium attachment groups were significantly more likely to have negative feelings towards undesired park environmental changes, such as feel some kind of personal loss, sadness, miss the characteristics of the park, and stop visiting the park and seek alternative places for recreation, than did the low attachment group; the high and medium attachment groups were also less tolerant towards negative park changes and they were more likely to become active to prevent their neighborhood park from the negative changes, such as complaining to relevant authorities, urge the residents committee to take actions, protest through community meetings, and join community activities to fight the changes, than did the low attachment group. However, park attachment only accounted for 2.6% and 3.3% of the variances in the behavioral intension of being sad and being active, respectively.

Finally, it was found that the high attachment group was significantly more willing to participate in park-related activities than did the other two groups, such as working in community gardens, attend public meetings to express ideas related to park design, work with park staff, and share the cost of park upgrade. However, park attachment only accounted for 5.2% of the variance in willingness of participation.

Table 5. 26 ANOVA – Differences between Park Attachment Groups regarding Mean Ratings of Park-related Attitude and Behavior Scales

	Park Attachment Group					
Park-related Attitudinal Inclination and Behavioral Intension	Low (n=79)	Medium (n=206)	High (n=83)	F	Sig	R^2
Park upgrade preference - create naturalistic landscape	3.56	3.51	3.84	6.936	.001	.037
Park upgrade preference - add cultural content	3.26	3.43	3.43	1.193	.304	.006
Park upgrade preference - increase sign of human intervention	3.62	3.73	3.93	5.097	.007	.027
Park upgrade preference - facilitate active recreation	3.55	3.68	3.76	2.092	.125	.011
Park upgrade preference - add artificial design elements	3.62	3.64	3.73	.513	.599	.003
Park upgrade preference - add natural design elements	3.50	3.53	3.69	2.091	.125	.011
Park upgrade preference - add local commercial facilities	2.92	2.96	2.58	3.386	.035	.018
Behavioral intention when facing negative park changes - being active	2.49	2.85	2.91	6.154	.002	.033
Behavioral intention when facing negative park changes - being sad	2.84	3.07	3.17	4.824	.009	.026
Willingness to participate in park related community activities	2.12	2.20	2.69	10.088	.000	.052

Scale: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree

Effect of Park Attachment on Neighborhood Attachment

Neighborhood attachment, also theorized as sense of community in some studies, is regarded as one of the key objectives of residential environment planning, and therefore is quite relevant to the current study. Therefore, as an extension of the exploration of the impacts of place attachment, one-way analysis of variance was conducted to examine Hypothesis 3b which concerns the effect of park attachment on neighborhood attachment, and the differences between the three attachment groups regarding their mean ratings on neighborhood attachment were compared.

The results (Table 5. 27) indicate that neighborhood attachment was significantly and positively associated with park attachment both for the three individual neighborhoods and for the entire sample. Post hoc tests revealed that differences between all the three attachment groups regarding the level of neighborhood attachment were all significant. As respondents' level of attachment to their nearby neighborhood park increased, their level of attachment to their own neighborhood also increased significantly. The results also indicated that park attachment was a strong predictor of neighborhood attachment: level of park attachment accounted for 23.4% of the variance in neighborhood attachment, suggesting a strong effect of park attachment on neighborhood attachment (Cohen, 1988, p. 414).

The results provide evidence to support the hypothesis that residents' positive emotional bonds with nearby neighborhood parks, which are integral parts of the physical environment of public housing new town, may contribute significantly to their positive emotional tie with the neighborhood in which they live. In other words, the results suggested that nearby open spaces that evoke a positive emotional connection among residents living around it have great potential

to foster a sense of community.

Table 5. 27 ANOVA – Differences between Park Attachment Groups regarding Mean Rating of Neighborhood Attachment

	Park Attachment Group					
Neighborhood	Low	Medium	High	F	Sig	R^2
Bukit Panjang (n=146)	3.14	3.37	4.05	19.583	.001	.215
Choa Chu Kang (n=103)	3.24	3.52	3.95	10.382	.001	.172
Woodlands (n=119)	3.22	3.50	4.21	27.282	.001	.320
Entire sample (N=368)	3.20	3.46	4.09	55.671	.000	.234

CHAPTER 6. SUMMARY AND DISCUSSION

This chapter presents the summary and discussion of this study. Firstly, the main points of this study are addressed through revisiting the research motivations, objectives, and approaches adopted. Secondly, the main research findings reported in the previous two chapters are summarized. Thirdly, the contributions and implications of the findings are discussed in relation to previous work. The final section discusses the limitations and suggestions for further research.

6.1. Research Overview

This study was initiated by the desire for a better understanding of the challenges faced by planners, designers, and decision-makers aiming at creating better urban open spaces, and especially those in public housing areas where the development of decent open spaces usually was assigned with low priority and their benefits to residents and the community have not been fully explored and addressed. In searching of the essential criterion of "good" open space, the concept of place attachment emerged from place literature as a very important aspect of people-environment relationship and a construct that is of crucial pertinence to the ultimate goal of the practice of our design professionals: creating place.

Despite the increase of place attachment studies carried out in a wide range of contexts and the accumulation of the insights gained from place attachment studies to the practice of environmental planning and management, there is a lack of effort to investigate this phenomenon in public housing context, where the positive motional bond between residents and the environment in which they live is regarded as one of the most important objectives of planning, and where the validity of open space development needs to be justified from a non-instrumental perspective. What is more urgent is the status-quo of the field of research of place attachment itself that is characterized by a lack of consensus on the underlying theoretical framework and agreements regarding the answers to the questions: What is place attachment? What are its sources? How does it develop? and What are its impacts?

With these research gaps in mind, the objectives of this study were formulated: to develop a theoretical framework to guide the investigation of the phenomenon of place attachment and empirically examine the derived research hypotheses concerning the nature, sources, mechanism, and impacts of place attachment in the context of nearby open spaces in public housing areas. It is hoped that this study will contribute to place research, advance our understanding of the people-environment relationship, and provide insightful suggestions to the endeavor of place-making that lies at the heart of design practitioners' work and the decision-making processes related to environmental planning.

A tripartite theoretical framework, grounded on review of place literature, was proposed that formed the basis upon which the current study was built. The framework delineated the key components comprising the phenomenon of place attachment and the relationships between them. Based on this framework, three groups of research hypotheses were proposed that were concerned with the dimensional structure of place attachment, its relationships with other

predictive constructs, the mechanism underlies its development, and its impacts on place-related attitudes and behavioral intentions, respectively. Three neighborhood parks in the public housing new towns in Singapore were chosen as the research settings based on their representativeness of landscape design, and residents living around the three parks were surveyed through a stratified sampling process. Data were collected from March to May in 2007 with the help of eighteen trained student assistants. The survey instrument was a self-administrated questionnaire containing both written questions designed to probe residents' use, perceptions, evaluations, feelings, thoughts, and other aspects of their relationships with neighborhood parks, and a photo preference rating task. A total of 400 residents took part in the survey and 368 qualified questionnaires were collected. Data were recorded and analyzed in statistical programs SPSS 14.0 and AMOS 6.0. Other than the basic descriptive analyses, the models concerning the dimensionality of place attachment and its relationships with other constructs under study as proposed in the hypotheses were examined via structural equation modeling technique and one-way analysis of variance.

6.2. Main Research Findings

What is the nature of place attachment?

One of the key objectives of this study is to explore the dimensional structure, or the intrinsic nature, of the construct of place attachment. Based on place literature, it is argued that other than the widely acknowledged place dependence and place identity dimensions, with the former referring to a functional reliance to place and the latter referring to a strong self-identity regarding to the importance of a place to individuals, a place caring dimension which implies people's concern about, care of, and commitment to place, is also an important aspect of the phenomenon of people-place bond and thus it needs to be included and examined as one of the constitutional component that underlies the structure of place attachment.

Given that place attachment study has not been conducted in public housing context before, it is important to examine the validity and reliability of the psychometric properties of the proposed measurement model of place attachment for public housing residents sample before further analyses concerning the relationships between place attachment and other constructs could be carried out. Therefore, based on review of previous studies, fifteen items were proposed to measure place attachment, five for each of the three hypothesized dimensions. In addition, four nested measurement models, each depicting different dimensional structure of place attachment according to different perspectives of theorization, were constructed and compared in an attempt to identify the relatively most superior model.

The results of confirmatory factor analyses through structural equation modeling indicated that the modified Group-Factor model, in which the three hypothesized place attachment dimensions were correlated with each other and upon which no higher order construct is dominating, demonstrated the best fit to the data compared with the other models (Table 5. 2). The followed invariance tests gave a stringent examination of the invariability of the factorial structure of this model and the results (Table 5. 3) indicated that this model was equivalent across the two

randomly split sub-groups of the sample in terms of the equality of the structure, factor loading, factor variances/covariances, error variances/covariances of the model, thus lending further support to the reliability of the three-dimension measurement model of place attachment.

The results of this study indicate that residents did form emotional bonds with their respective neighborhood parks. However, their attachment varied across the three compositional dimensions. In terms of the relative magnitude, respondents' care for neighborhood park (place caring dimension) stood out as the most salient, since its mean rating was constantly the highest across the three neighborhoods. This suggests that residents did care to a greater extent about their neighborhood parks. Not only did they want to know more about the history of their neighborhood parks, but also they paid particular attention to the current condition of their parks. They showed strong interests in how their parks will be transformed in the future and they also demonstrated strong commitment to their parks and willingness to invest their own time and energy in park-related activities. To a lower but still above medium degree did residents feel closely connected with neighborhood parks emotionally and regarded these nearby open spaces as symbolizing their own self-identity (place identity dimension). Generally speaking, residents did not seem to rely so strongly on their neighborhood parks functionally (place dependence dimension) that they will not substitute other open spaces for it in terms of everyday recreation. In other words, neighborhood park might not be regarded by residents as an irreplaceable place for various recreation activities compared with other available alternative settings. Each of the three forms of park attachment represents only one aspect of the bonding relationship between residents and their neighborhood park and thus cannot be understood separately from the other dimensions. In a nutshell, the three-dimension structural model improved our understanding of the essential nature of residents' attachment feeling to nearby neighborhood parks by capturing its manifestations in three distinct aspects.

Therefore, regarding the nature of the construct of place attachment, empirical evidence obtained from this study provided strong support to Hypothesis 1: **Place attachment is a multidimensional construct. It is best understood as being composed of three distinct but interrelated dimensions: place dependence, place identity, and place caring.**

What are the sources of place attachment, and what underlie the mechanism of the development of place attachment?

With the hypothesized dimensional structure of place attachment confirmed, the measurement model of place attachment was then included in the followed path analyses aiming at verifying the significance of place meaning in the development of place attachment by examining first, the individual direct effects of a series of predictor variables on place attachment; second, the effects of each of the significant predictor variables on place attachment when included with the other variables; and third, the mediating role that place meaning plays in the prediction of place attachment.

The results (Figure 5. 14) indicated that, among the socio-economic factors, age was the strongest predictor of all three place attachment dimensions, followed by level of environmental knowledge and frequency of environment-related activities. Length of residence was found to

have no effect on place attachment.

It was also found the characteristics of the physical environment of a place did affect the emotional bond with that place, and it might be the homogeneity and the prominence of the landscape character that matters to place attachment. The results (Figure 5. 15) indicated that residents living near neighborhood parks that are characterized by either predominantly natural or geometric landscape tended to have stronger positive emotional tie with the park on all three aspects of place attachment.

Besides the factors related to people and that related to place, it was also found that place attachment might be affected by other factors reflecting various aspects of people-place interactions. Among the three place experience factors identified from factor analysis, frequency of park-based passive recreation was a significant predictor of all three aspects of place attachment, whereas family-member-involved activities only affected place caring and place identity (Figure 5. 16). Frequency of park-based active recreation, on the other hand, did not affect any aspect of place attachment. In addition, the scale indicating residents' frequency of park-based social interactions was also a significant predictor of place attachment (Figure 5. 17).

Regarding the effects of place perception on place attachment, since the identified relationships between preference for geometric and naturalistic landscapes and place attachment did not seem to lend support to any reasonable explanation, a place-specific perception scale, i.e. preference for the landscape of one's own park, was constructed and it was found to have significant effect on place attachment (Figure 5. 19). In addition, the results (Figure 5. 20) indicated that distinctiveness of the physical environment as perceived by people may also contribute to place attachment: perceived uniqueness of artificial and natural park design features were both significant predictors of park attachment, with the effect of the former on place dependence being slightly stronger than the latter and its effects on place caring and place identity being slightly weaker than the latter.

In terms of the effects of place satisfaction on place attachment, the results (Figure 5. 21) indicated that, among the two park quality evaluation scales as identified from factor analysis, perceived natural quality was a significant predictor of place attachment, whereas the orientation and comfort qualities had no effect on place attachment. A more general scale indicating residents overall evaluation of the quality of their own neighborhood park was also constructed, and it was found to be significantly and positively associated with park attachment (Figure 5. 22).

Finally, the effect of place meaning on place attachment was examined and the results (Figure 5. 23) indicated that level of agreement with place meanings was significantly and positively related to degree of place attachment, as indicated by the high path coefficients associated with all three attachment dimensions.

Generally speaking, in terms of the proportion of variance in place attachment that was accounted for by each domain of predictor variables individually, identification with place meanings and perceived natural quality were consistently the strongest two predictors across all

three attachment dimensions, whereas place characteristic, i.e. being living near a park with a strong landscape character or not, was consistently the least effective predictor.

These findings provided support for Hypothesis 2a: **Place attachment may vary depending on a variety of factors, such as the physical characteristics of place, people's socio-economic characteristics, their experience of place, their perception of the characteristics of the physical environment of place, their satisfaction with place, and their level of agreement with the meanings attributed to place.**

Other than the individual direct effects, the relative importance of the significant predictor variables in the prediction of place attachment net of the effects of the other variables were also examined by entering all the significant predictors from each domain simultaneously into a path model as independent variables.

The results (Figure 5. 24) indicated that this group of predictors accounted for quite a large proportion of the variance in place attachment. However, the significant predictive domains varied across the three attachment dimensions. Level of identification with park meanings and being living near a park with a prominent landscape character remained to be the only two factors that consistently had positive effects on all three park attachment dimensions. Besides, significant predictive domains of park caring were reduced to park experience (frequency of family-member-involved activities in park) and socio-economic characteristics (level of environmental knowledge); significant predictive domains of park dependence included park perception (preference for the landscape of one's own park), park satisfaction (perceived natural quality of the park), and park experience (frequency of passive recreation); and significant predictive domains of park identity only included park satisfaction (perceived natural quality) and park experience (perceived uniqueness of natural design features). Comparing the magnitude of the significant path coefficients associated with each of the park attachment dimensions, it is obvious that the place meaning domain, i.e. identification with park meanings, was the strongest predictor even after controlling for the effects of the other significant predictors.

Together with the findings reported in the previous section, the results provided further support for Hypothesis 2b: **Among the predictor variables, identification with place meaning is the most prominent one in terms of the contribution to place attachment.**

In order to further confirm the significance of place meaning in the development of place attachment, a series of mediation analyses via structural equation modeling were conducted to examine the mediating role of identification with place meanings in the prediction of place attachment (Figure 5. 25 - Figure 5. 40; Table 5. 9 - Table 5. 24).

The results indicated that place meaning did mediate, either partially or completely, the relationships between the majority of the predictors under study and the three place attachment dimensions. It was found that identification with park meanings completely mediated the relationships between frequency of passive recreation and park caring, perceived uniqueness of artificial park design features and park caring and park identity, and perceived uniqueness of

natural park design features and park caring.

On the other hand, it was also found that identification with park meanings was a partial mediator of the influences of age, frequency of park-based social interactions, preference for one's own park, perceived natural quality, and general park satisfaction on all three park attachment dimensions. It also mediated part of the effects of passive recreation on park dependence and park identity, perceived uniqueness of artificial park design features on park dependence, and perceived uniqueness of natural features on park dependence and park identity. In terms of the magnitude, the proportions of these indirect effects mediated via identification with park meanings to their corresponding total effects were high, ranging from 27.3% to 61.8%.

Only the effects of level of environmental knowledge, frequency of environment-related activities, frequency of being with family in park, and park characteristics on park attachment were found not to be mediated via identification with park meanings.

These findings provided evidence to support Hypothesis 2c: **Identification with place meaning plays a crucial role in the development of place attachment in that it mediates the relationships between other predictor variables and place attachment.** In other words, the findings indicated that identification with place meanings might be one of the key prerequisites leading to the development of place attachment.

To sum up, the results suggested that not only place meaning was the most significant predictor of place attachment in terms of the magnitude of its effects on all the three attachment dimensions, but also it mediated, either partially or completely, the effects of the majority of the predictor variables under study on place attachment. Therefore, this study provided substantial empirical evidence to support Hypothesis 2: **Place attachment may vary depending on a variety of factors, among which identification with place meanings is the most prominent one because it mediates the relationships between place attachment and its predictors: place attachment is a meaning-based concept.**

What are the impacts of place attachment?

Finally, the attitudinal and behavioral implications of place attachment were examined. The results (Table 5. 26) indicated that the attitudes and behavioral intentions related to neighborhood park were not homogenous across park attachment groups. High attachment residents were more likely to support park design and management strategies aiming at creating more naturalistic landscape and increasing signs of human interventions than did those of lower degree of attachment, and they also expressed stronger objection to adding commercial facilities in the park. It was also found that high attachment group was more likely to have negative feelings when facing undesirable park changes and they were more likely to become active and take concrete actions to protect their park from the threat of these negative changes. In addition, high attachment group showed stronger willingness to participate in community activities that may help to enhance the quality of their neighborhood park. Although the variances accounted for by place attachment were not high in magnitude as indicated by the small R^2 values associated with each of the attitude and behavior scales, these findings did provide

evidence for Hypothesis 3a: Place attachment affects people's attitudes towards environmental design and management, their behavioral intentions when facing negative environmental changes, and their willingness to participate in place-related activities.

As an extension of the exploration of the impacts of place attachment, one-way analysis of variance was also performed to examine the differences of neighborhood attachment among park attachment groups. It was found that significant differences existed between each pair of attachment groups and this pattern of relationship was consistent across the three neighborhoods and the entire sample (Table 5. 27). The results indicated that the stronger the park attachment, the stronger the neighborhood attachment. In addition, park attachment was a strong predictor of neighborhood attachment since the former accounted for a large proportion of the variance in the latter. Therefore, Hypothesis 3b was supported: In the context of public housing, residents' attachment to nearby open space is a significant contributor to their attachment to the neighborhood they live in.

To sum up, these findings demonstrated that place attachment is not an end in itself, and they provided evidence to support Hypothesis 3: Place attachment has substantial implications to place-related attitudes and behaviors.

6.3. Contributions and Implications

On what aspects do the aforementioned findings contribute to our understanding of the phenomenon of place attachment and people-environment relationship? What are the implications of the findings to open space planning in public housing and the endeavor of place-creation? This section discusses the contributions and implications of the research findings of this study in light of previous work.

6.3.1. Theoretical Implications

Theoretical framework

This study has contributed to the current discussion of people-place bonding in particular and people-environment relationship in general by proposing a new theoretical framework to structure the exploration of the phenomenon of place attachment.

The tripartite framework proposed is consistent with the theoretical stance of place researchers, such as Rapoport (1977), Canter (1977, 1991), Shumaker and Taylor (1983), and Low and Altman (1992), who argued that greater theoretical coherence regarding people-environment relationship research can be achieved by integrating the investigations of the cognitive, affective, and conative processes involved in people-place interactions. This framework offers a new perspective to look into the phenomenon of place attachment as a whole and it enables the researcher to delineate the components of this phenomenon with more clarity and articulate the relationships between them in a more comprehensive and systematic way. Guided by this framework, this study has gained insights into place attachment regarding its nature, sources, mechanism, and impacts: place attachment is a positive affective response in nature that can be best understood as a multifaceted construct composed of three dimensions: place caring, place dependence, and place identity; place attachment may be affected by a variety of structural and cognitive factors, among which identification with place meanings is the most significant one as it underlies the mechanism of the development of place attachment by mediating the relationships between other predictor variables and place attachment; and finally, place attachment has conative implications as it may affect place-related attitudes and behaviors significantly.

Similar attempts to use the tripartite affective-cognitive-conative conceptualization to explore the phenomenon of place attachment can also be found in previous research, such as Kyle and colleagues' work (Kyle, et al., 2005; Kyle, Mowen, et al., 2004). However, in their studies this tripartite theorization was used to structure the concept of place attachment itself rather than the whole range of processes involved in the development of place attachment. It is believed that this may have led to a confusion of the affective nature of place attachment with its cognitive sources, thus resulting in their mistaking one of the antecedent processes of place attachment, i.e. social bonding, for one of the dimensions of place attachment. The low Cronbach's alpha value associated with the social bonding scale as reported in their studies indicates pool internal consistency of the measurement items and raises concerns regarding the soundness of theorizing social bonding as a constitutional dimension of place attachment.

The findings of this study and the examples cited above remind us the importance of the construction of theoretical framework with broader perspective in research concerning complex phenomenon involving a variety of processes such as place attachment because the larger picture provided by the framework can help to enable us to avoid confusing the components of the phenomenon of interest with each other and misinterpreting the relationships between them.

Dimensionality of place attachment

This study contributes to the current literature regarding the dimensionality of place attachment by providing empirical evidence to support the notion that place attachment is a multidimensional construct in nature.

Firstly, the evidence comes from the superiority of the multidimensional structurization of place attachment. The results demonstrated that a correlated-three-factor model exhibited the best fit to the data than the other three models: a bi-factor model, a second-order model, and a unidimensional model, which actually exhibited the poorest fit. This indicates that it might be appropriate to think of place attachment as being represented by a strong personal care of and concern about the condition of the place as well as willingness to commit to the place, a persistent functional reliance on the place, and a strong emotional bond with the place and a tendency to use the place as a symbol of self-identity. Though correlated, the three dimensions are distinct from each other in nature, and therefore, cannot be merged into one construct.

The existence of the place dependence and place identity dimensions as confirmed in this study is consistent with previous studies (Bricker & Kerstetter, 2000; Brown & Raymond, 2007; Harmon, 2005; Kyle, Bricker, et al., 2004; Kyle, Graefe, & Manning, 2004; Kyle, Graefe, et al., 2003; Kyle, Graefe, Manning, et al., 2004a, 2004b; Kyle, Absher, et al., 2003; Moore, 1991; Moore & Graefe, 1994; Williams & Vaske, 2003) which have theorized and found empirical evidence that place attachment implies a functional importance of place to people's utilitarian purposes and a symbolic importance of place to people's self-identity.

In addition, this study represents the first attempt to test place caring as an additional dimension of place attachment. It is argued that place caring represents people's explicitly expressed care for and concern about the condition of the place, an eagerness to know the history of the place, and a willingness to commit to and engage in the place. Not only was the validity and reliability of this new dimension confirmed in this study through confirmatory factor analysis, but also the salience of this dimension was demonstrated: across the three neighborhoods under study, respondents' degree of park caring was consistently higher than that of their park dependence and park identity (Table 5. 6). The distinctiveness of this dimension was also reflected in its relatively weak correlations with the other two dimensions.

Theoretically, the findings suggests that place attachment implies not only a passive "place-to-people" relationship as represented by place dependence and place identity that emphasizes the aspects that place may contribute to people, either functionally or psychologically, or why place is import to people, but also an active "people-to-place"

relationship as represented by place caring that emphasizes people's intention to positively affect and contribute to place. What characterizes place caring resembles what "sense of place" implies – a conscious effort to "knowing about" place and "the deliberative acts of creating and maintaining place", as noted by Tuan (1980, pp. 6, 8). Given the lack of discussion of this component in current literature, this study demonstrates that place caring reflects an import aspect of the people-place bonding relationship and deserves more theoretical and empirical attention in future place attachment studies.

Secondly, the multifacetedness of place attachment is manifested in the heterogeneity regarding the relationships between place attachment dimensions and other variables. The results of testing Hypothesis 2a and 2b, as summarized in the previous section, have demonstrated that the significant predictor variables and antecedent processes of each of the three attachment dimensions varied and the strength of their effects were not identical. In other words, the predictors were affecting different aspects of place attachment in different ways.

This is consistent with the standpoint of previous research regarding the dimensionality and the appropriateness of applying a single global index as an indicator of place attachment, which is acknowledged as a multifaceted phenomenon of complex nature and one embedded with diverse meanings (Gerson, et al., 1977), to explore its relationship with other constructs. For example, Ringel and Finkelstein (1991, p. 189) pointed out that, although a unidimensional measure of attachment-to-neighborhood may be efficient to assess residents' composite rootedness, bonding, and satisfaction, it would not be helpful to explore its subdimensions' relationship with other variables. Harris et al. (1996, p. 299) also argued that place attachment is best conceptualized as a set of phenomena rather than a single construct, and a singular global definition of attachment may result in a narrow and possibly misleading set of findings. Bricker and Kerstetter (2000, pp. 244, 252) have discussed the necessity to use multidimensional approach to measure complex concepts like recreation specialization and place attachment, and their findings did supported their points: the effects of different types of specializations on the dimensions of place attachment varied. Kyle et al. (2003, pp. 265-266) also noted that, although multidimensional measures of activity involvement and place attachment may prone to complicate interpretation, they do have greater potential to provide insights into the nature of these phenomena than unidimensional scales. In a later study, Kyle et al. (2004b, p. 222) noted that the two sub-dimensions of place attachment, place identity and place dependence, may not act uniformly, since they found that these two dimensions had different impacts on respondents' evaluations of social and environmental conditions. Kyle et al. (2004b) thus argued that "global interpretations of place attachment's effects are somewhat misleading" (p. 223).

The existence of and the distinctions between the dimensions of place attachment as identified in this study have strong theoretical implications: It might be more appropriate and advantageous to adopt a multidimensional perspective in theorizing the concept of place attachment and its relationships with other constructs because its components may have different origins, meanings, and influences. Therefore, unidimensional theorization and operationalization of place attachment might be misleading. Accordingly, using a single scale

or composite index as a general indicator of place attachment without differentiating its sub-domains might run the risk of oversimplification and failing to capture the complex nature of this construct.

Moreover, consistent with previous research (Gobster & Hull, 2000) focusing on nature restoration, the place caring dimension as confirmed in this study has substantial practical implications particularly in terms of the role it plays in environmental stewardship programs. The findings here suggest that it is important for resource managers to understand the care and concern embedded in people's attachment feeling so that it can be channeled in appropriate way to stimulate their momentum of active engagement in nature restoration and other environment-related activities.

Place meaning and place attachment

This study has contributed to place research by providing empirical evidences to support the theorization that place attachment is a meaning-based construct. The results suggest that it is based on agreement with the meanings of place that attachment to place develops, or put it in another way, identification with place meanings is one of the most important antecedents of place attachment.

Current literature of place attachment focused more on describing the magnitude of and the direct effects of its antecedents on attachment and less on the processes that underlie its formation. It is argued that since meaning is the core of the concept of place, emotional attachment to place must be built on positive appreciation towards the meanings ascribed to place during the processes of people-place interactions. Therefore, identification with place meanings might be an important prior condition of place attachment.

It was found that not only was identification with place meanings the strongest predictor of all three dimensions of place attachment, either being analyzed alone (Figure 5. 23) or with the other significant predictor variables (Figure 5. 24), but also it mediated, either completely or partially, the effects of more than half of the predictor variables under study on place attachment (Table 5. 9 - Table 5. 24). The results indicated that why residents feel attached to their neighborhood park might be due, to a significant extent, to their agreement with the diverse meanings symbolized by the park based on their experiences with, perceptions towards, and evaluations of the park. This suggests that place meaning plays a crucial role in the prediction of place attachment and agreeing with the shared meanings attributed to place is probably one of the most important antecedent processes of emotional bond with place.

The findings further support the theoretical stance of researchers such as Tuan, Relph, and Ryden, who emphasized that place, as a socially constructed entity, is characterized by the myriad meanings ascribed to it. The results also echo the empirical evidence reported in a series of studies conducted by Richard Stedman, who found that 1) to a significant extent, place attachment is a function of degree of agreement with the symbolic meanings of place (2002); 2) the meaning-mediated model provided a better explanation of the mechanism underlying the influences of physical features on place attachment (2003); and 3) place

meanings mediated the influences of place characteristics and place experiences on place attachment (2000).

Theoretically, the findings shed light on the mechanism underlying the development of place attachment and emphasize the importance of grasping the meanings attributed to place in understanding attachment to place. It is very likely that during various forms of people-place interactions, which include experiential, perceptual, and evaluative processes, the meanings of place are understood and appreciated, and this lays the very foundation for and stimulates the development of emotional tie with place. Therefore, it is crucial to know about the range of shared meanings of a place and people's responses to them in order to develop a better understanding of the formation of place attachment.

In this research, majority of the meaning items under study merged into a single factor, suggesting that participants did not differentiate these meanings as mutually exclusive or regarded them as subordinating to higher order meaning domains. It could means that to HDB residents, neighborhood parks represent a variety of symbolic meanings of varying degrees of significance and they agree that, based on their park experiences, perceptions, and evaluations of the various aspects of the park environment, these diverse ideas and beliefs concerning neighborhood parks are more or less interconnected in a complex way and cannot be separated from each other arbitrarily. This is congruent with Kong and Yeoh's (1995) notion, who contend that place is "multicoded" because it often consists of "a nesting of different but overlapping images and interpretations" (pp. 13, 14). Therefore, mutually contradictory or reinforcing meanings as results of different experiences can be attributed to the same place. For example, to residents, neighborhood park may represent both an ideal place for recreation and a convenient community stage of their social relationships, and at the same time it may also mean exuberant greenery counterbalancing the high-rise high-density built environment of HDB new towns and an integral component of the urban open space system that symbolizes the "Garden City" as envisioned by the nation. In other words, in the eyes of HDB residents, neighborhood park may resemble a "mosaic" of meanings. Each component piece of this mosaic has its own shape and color and they together create a unique total picture that cannot be grasped in a fragmentary way. It is with this "mosaic of meanings" represented by neighborhood park that residents identify and from which affective bonding with these settings gradually come into being.

It is also recognized that the results reported here might be an artefact of the research design of this study since the range of meaning items covered in analysis were limited. Thus, the results do not deny the possibility that there might be other park meanings, for example natural park as symbolizing a place for nurturing (Kong, Yuen, Briffett, & Sodhi, 1997), that are also salient and strongly agreed upon by residents. Therefore, different groups of dominant park meanings to which residents hold different levels of agreement might be identified by taking into account these omitted park meanings. Thus the results of this study must be interpreted with caution and further research is needed to recruit a wider range of meaning items in analysis. This will help to provide a much detailed picture of the processes leading to place attachment by informing us how various factors affect people's identification with each of the salient meaning

domains, which in turn exert different impacts on different dimensions of place attachment.

Although the formation processes of place meanings were not discussed in this study, some of the findings regarding the factors that may influence people's responses to place meanings are well worthy of note. Consistent with previous work, such as Brandenburg and Carroll's (1995), who discovered that stakeholders' personal experience of place shaped their environmental values and landscape meanings regarding a river drainage towards which conflicting perspectives were held, this study has found that place experience did contribute to identification with place meanings and the significant experiential factors identified in this study were passive recreation and park-based social interactions. This reiterates the predominant view in current literature that human interactions with place are the primary sources of place meanings (Eisenhauer, et al., 2000; Relph, 1976; Tuan, 1977). The results also demonstrated that perceptions and evaluative beliefs towards place had and even stronger impacts on agreement with place meanings than did direct experiences with place. It was found that general park satisfaction and perceived natural quality of park were most strongly related to identification with park meanings. This was followed by perceived uniqueness of natural and artificial design features and preference for the landscape of one's own park. From theoretical perspective, this suggests that experience might not be the only factor significantly influencing meanings. Perception and evaluation related to the character and quality of place that might not be all resulted from direct contact with place can also influence the way through which place meanings are understood and appreciated. Therefore, there is the need to look beyond direct experiences of place and probe both place-related perceptions and evaluations when investigating factors contributing to identification with place meanings.

The significant role that place meaning plays in the formation of place attachment as identified in this study implies that for decision-makers, designers, and authorities in charge of environmental management, it is important to be aware of the potential nature and range of meanings ascribed to place and the possible impacts of environmental interventions on these meanings in the processes of creating places to which people feel emotionally attached. As Stedman (2003) stated, "attempts to manipulate landscape in the service of attachment will fail if meanings are not considered" (p. 683). For those places where no single domain of meanings predominates, efforts to improve the environment should avoid over-emphasizing one or several specific meanings while ignoring or jeopardizing the others that are equally cherished by people. For those places that are currently dominated by one or several meanings, design efforts are needed to further enhance the salient meanings agreed upon, while at the same time keeping the program flexible and making room to nurture other meanings. Even more important are places that hold conflicting meanings, for example, neighborhood park as symbolizing both a setting to meet human recreation needs and an undisturbed wildlife habitat to enhance urban biodiversity. In such circumstances, well-balanced design and management strategies are needed to ensure no one-sided objectives are emphasized and both socially and environmentally relevant place meanings can coexist and be sustained. One important approach to capture the diverse meanings attributed to a place is to involve the people living there in the decision-making process, which will be discussed in the following section.

Place experience and place attachment

In addition to place meaning, this study has discovered that place attachment can be affected by a variety of other factors. Regarding their theoretical implications, some of these factors merit further discussion in relation to previous findings.

It was found that, except the indirect effects mediated via identification with park meanings, non-intensive recreation such as passive recreation and being with family and park-based social interactions had significant and positive direct effects on park attachment (Table 5. 14, Table 5. 16), whereas active recreation was unrelated to any of the attachment dimensions. The findings imply that not only the intensity but also the type of experience matters to place attachment. The results are consistent with previous research and lend credence to the predominant notion in place literature that place attachment is a function of place experience and different modes of experiences may have different influences on the formation of emotional bond (Feldman, 1990; Kaltenborn, 1998; Milligan, 1998; Moore & Graefe, 1994; Ryan, 2000, 2005; Tuan, 1977; Tuan, 1974a; Williams, et al., 1992).

The insignificant effect of active recreation on park attachment as revealed in this study is different from what suggested in leisure research (Kyle, Bricker, et al., 2004; Kyle, Graefe, et al., 2003) that recreationists' level of involvement with active outdoor leisure activities, such as hiking, boating, and angling, were significantly and positively related to their level of attachment to the recreation settings. The explanation might be that in the contexts of large outdoor recreation settings, obtaining the leisure experiences through intensive involvement with the preferred activities is the primary objective of recreationists' visit to these settings. Therefore, they will value the site based on its goodness of support for the activities, and their attachment to the setting will develop mainly centering around the activities they have over there. In public housing context, however, nearby neighborhood park might not be the only site suitable for active recreation. Residents are provided with a wider range of alternative settings convenient for such kind of activities such as precinct playgrounds, town parks, regional parks, and riverside park connectors. Thus, frequency of using nearby neighborhood park for active recreation may bear no significant influence on the development of emotional connection with the park. Theoretically, this suggests that various types of place experiences are not equally important regarding their influences on place attachment and the strength and valence of their effects may vary in different contexts. Therefore, it may not be appropriate to generalize the pattern of relationships between specific place experiences and place attachment found in one setting to another without full understanding of the composition and nature of people's place experiences in the new context.

The positive association between frequency of park-based social interactions and park attachment provides further support to the widely acknowledged notion in current literature that place-based social relationships are important sources of attachment (Cuba & Hummon, 1993; Eisenhauer, et al., 2000; Gerson, et al., 1977; Goudy, 1990; Hidalgo & Hernandez, 2001; Low & Altman, 1992; Mesch & Manor, 1998; Sampson, 1988), and is in accordance with local research that has reported that the social opportunities offered by nearby neighborhood parks were highly appreciated by residents (Yuen, 1996b) and that social encounters between neighbors

as they go about their daily routines will help to create a sense of familiarity, strengthening community ties and hence a sense of belonging for the community (Ooi & Tan, 1992). Therefore, the significant relationships with others to which neighborhood parks are the convenient physical backgrounds may have contributed to residents' emotional bonding to the parks. However, the relatively small magnitudes of the effects of social interaction on park attachment dimensions (Figure 5. 17) suggest that its influence on attachment was somewhat limited in the current context. This might be attributed to respondents' relatively low frequency of social interaction within neighborhood park compared with other types of park-related experiences (Table 4. 27).

The importance of place-based experience in the development of place attachment was also reflected indirectly in other findings here. Contrary to evidence obtained in some studies (Hay, 1998b; Kasarda & Janowitz, 1974; Moore, 1991; Moore & Graefe, 1994) but in line with other research (Harmon, 2005), this study found that length of residence did not seem to have significant effect on park attachment, either directly or indirectly via other factors, echoing what Tuan (1977, p. 198) has pointed out that quality and intensity of experience matters more than simple duration in the formation of attachment. Theoretically, the results are in accordance with Gerson et al. (1977) and Harris et al. (1996) and suggest that length of residence might not be a determinant of place attachment. Long term association with a place alone may not guarantee the formation of place attachment unless it is accompanied by frequent experiences and interactions with the environment of that place.

Place characteristic, place perception, and place attachment

This study has found marginal, however significant, direct effects of place characteristics on place attachment. Those who are living near neighborhood park with a salient landscape character, be it naturalistic or geometric, exhibited significantly higher level of park attachment than did those whose neighborhood park is not dominated by a single landscape that can be clearly delineated (Figure 5. 15). In addition, it was found that the effects of park characteristics on park attachment were not mediated via identification with park meanings alone (Table 5. 12).

Do the results imply that physical characteristics have autonomous influences on place attachment that are independent of people's cognition? Does this mean that park designed in certain landscape style will automatically evoke feelings of attachment among its users? Further scrutinization of the results of the path model examining the indirect effect of perceived uniqueness of park design elements on park attachment suggests an explanation that may avoid conclusions prone to environmental determinism. As shown in Table 5. 20, being living near neighborhood park with predominant natural or geometric landscape was positively related to perceived uniqueness of park design features, which in turn had either direct effect on place attachment or indirect effect through identification with park meanings. In other words, the results suggest that the effects of park characteristics on park attachment might be mediated via both perceived uniqueness of park design features and park meanings. The reason why those who live near neighborhood park with predominant naturalistic or geometric landscapes felt more attached to their park was probably because they were more aware of the landscape characteristics and appreciated more the prominent design features as distinct from the other

parks. This enhanced their identification with park meanings and further, attachment to the park.

The results also suggest that it might be the homogeneity and prominence, or the "pureness", of the landscape character rather than the specific style of the landscape as defined by design professionals that actually accounts for the effect on place attachment. The less ambiguous the character of the landscape, the stronger its perceived distinctiveness and the greater its potential to establish emotional tie with people. Compared with Bukit Panjang neighborhood 5 park and Woodlands neighborhood 6 park, which are dominated by landscapes whose characters are easily discernible, the landscape of Choa Chu Kang neighborhood 7 park is relatively more heterogeneous and less explicit. Although the curvilinear artificial dry stream with bushy banks within this park was designed as a highlighting landscape feature and was highly preferred by residents (Table 4. 12), its unique character may have been counterbalanced or even overwhelmed by the presence of the superimposed geometrically-laid pathways, the sporadically planted trees along the roads, and the poorly maintained lawn that takes up a large proportion of the park, making the main landscape character of this park less easy to tell. This was reflected in the results reported in Table 4. 19: Choa Chu Kang respondents had the lowest mean ratings on perceived uniqueness of both the artificial and natural design features of their own park than did the other two neighborhoods. Therefore, it might be the un-ambiguity of the landscape characters of both Bukit Panjang neighborhood 5 park and Woodlands neighborhood 6 park that has contributed significantly to the perceived uniqueness of their design features, which in turn contributed to respondents' identification with and attachment to these two parks. According to previous research (Kaplan & Kaplan, 1989), people's familiarity with the landscape might affect their landscape preferences. However, it is argued that the cause-and-effect connection between familiarity and place perception, identification with place meanings, and place attachment might not be tenable because familiarity might be independent of evaluative appraisal and emotional responses toward the environment. Therefore, more research is needed to examine the relationship between familiarity and place attachment.

These findings are relevant to the current discussion about the role of physical environment in the development of place attachment and sense of place, such as Stedman (2003), who found empirical evidence that characteristics of the physical environment are the basis of place meanings, which in turn affect place attachment. In a sense, this study complements Stedman's work in that it emphasizes a missing link in his theorization – place perception. The results provide support to the points argued in the Research Needs section in Chapter Two that the influences of place characteristics on place attachment may not be independent of place perception, which refers to people's subjective responses to the physical characteristics of the environment. Rather, place perception is the "bridge" that connects the objective physical features and people's cognitive and affective responses to the physical environment. Certain environments evoke strong attachment feelings only because the qualities of their physical characteristics are perceived, understood, and identified with by people as such. Therefore, drawing a direct link between physical environment and place-related affect without probing into the environment-related perceptual and the cognitive processes involved is not appropriate. Theoretically, the findings emphasize the importance of understanding place perceptions in

understanding the relationships between place characteristics, place meanings, and place attachment.

6.3.2. Practical Implications

Other than contributions to the theoretical discussion related to place attachment, this study also offers a variety of implications to the planning, design, and management of urban open spaces in public housing areas and place creation in general.

User characteristics

Regarding the effects of user characteristics on place attachment, this study suggests that age might be a significant factor. It was found that age was significantly related to park attachment (Table 5. 9) and its effect was probably mediated via identification with park meanings (Table 5. 10) and other experiential (Table 5. 14, Table 5. 16), perceptual (Table 5. 18), and evaluative factors (Table 5. 18). The results indicate that older people tend to feel more strongly attached to neighborhood parks because they are more likely to agree with the meanings attributed to these nearby open spaces. Although this study found that older respondents tended to have less social interactions in park, they did have passive recreation and family-member-involved activities more frequently in park than younger respondents, thus resulting in contributing to park attachment both directly and indirectly via park meanings. Preference for the landscape of one's own park and general satisfaction with the park quality were also factors that explained older people's attachment to neighborhood park. The results are consistent with previous research emphasizing the value of nearby natural areas to elderly residents (Talbot & Kaplan, 1991) and significant contribution of use of green outdoor common spaces to older adults' neighborhood social tie and sense of community (Kweon, et al., 1998). This implies that open space planners and designers should pay more attention to older people's recreation needs and their behavioral patterns, encourage their social interactions within neighborhood parks, and make efforts to facilitate their favorite activities, especially passive recreation and family activities, so that their attachment to neighborhood park will be sustained and enhanced. On the other hand, planning and design strategies need to be proposed to encourage younger and middle-aged people's use and appreciation of nearby open spaces to strengthen their emotional connections with these settings.

Balanced landscape design strategies

What kinds of landscapes or physical features should be paid more attention to in park design that might enhance people's attachment to nearby open spaces? Regarding this questions, this study seems to have provided seemingly contradictory but mutually complementary information.

On the one hand, it appears that the natural aspect of a setting does matter a lot to place attachment. It was found that perceived uniqueness of natural design features (Table 5. 20) and perceived natural quality of the park environment (Table 5. 22) had stronger relationships with identification with park meanings and the park caring and park identity dimensions of park attachment than did artificial design features. This reflects the notion widely documented in literature that people prefer natural over built landscapes and that natural design elements and

contact with naturalistic environment are highly valued for their diverse contributions to human health and well-being (Hansmann, Hug, & Seeland, 2007; Hartig, Mang, & Evans, 1991; Kaplan, 1992; Kaplan & Kaplan, 1989; Kaplan, 1995; Korpela, Hartig, Kaiser, & Fuhrer, 2001; Smardon, 1988), and is in line with previous findings suggesting that the potential restorative effects associated with natural environment experiences may lead to the formation of place attachment and place identity (Jorgensen, Hitchmough, & Dunnett, 2007; Korpela, et al., 2001).

On the other hand, it seems that naturalistic landscape was not favored as highly as geometric landscape and it was not the sole significant contributing factor of attachment. Artificial design features and formal landscape were also highly preferred and capable to evoke park attachment. This study revealed that manicured landscapes showing both natural and artificial design features and park landscapes dominated by geometric pattern and built features were most preferred whereas predominantly naturalistic, forest-like landscapes were least preferred (Table 4. 12). In addition, respondents were more favorable to park upgrade proposals showing more signs of human interventions, providing better support for active recreation, and including more architectural design elements, and less favorable to design and management strategies tending to increase natural design elements and promote naturalistic landscape (Table 4. 37). Moreover, perceived uniqueness of artificial design features was also positively related to identification with park meanings, though the magnitude of the association was slightly smaller than that of natural design features, and its effects on park dependence dimension of park attachment was stronger than that of natural features (Table 5. 20). The results support previous research that benefits of urban open spaces are not attributed to naturalistic landscapes alone and that formal landscapes also hold strong appeal for people as they are perceived as safer and more peaceful and therefore more calming and stress-relieving (Özgüner & Kendleb, 2006). For example, there are studies suggesting that inner city public housing residents generally preferred neat and ornamental landscapes with built features and well-manicured vegetations that have a sense of openness and visibility over natural and densely wooded areas with a sense of enclosure that were perceived as untidy and unsafe (Kaplan & Talbot, 1988; Talbot & Kaplan, 1984). Other study also found that suburban residents with high fear expectancy, disgust sensitivity, and desire for modem comforts were more likely to prefer manicured park settings and urban environments and reject wildland environments (Bixler & Floyd, 1997).

The results are relevant to the ongoing discussion on the advantages and disadvantages associated with naturalistic versus formal landscapes in urban areas and they confirm the point that both natural and formal landscapes in an urban setting are beneficial to urban dwellers and the public appreciate them for different reasons (Özgüner & Kendleb, 2006). As is evident in the results of analysis examining the relationship between park attachment and attitudes towards park upgrade proposals. High attachment group was significantly more supportive to two groups of seemingly conflicting design and management strategies, creating naturalistic landscape and increasing signs of human intervention, than did medium and low attachment respondents (Table 5. 26). This indicates that people appreciate naturalistic landscapes and natural design features, but they also prefer neat, tidy, organized and managed landscapes, and built features as they represent “cues to care” - recognizable landscape language that communicates human intention to care for the landscape (Burgess, Harrison, & Limb, 1988;

Jorgensen, et al., 2007; Nassauer, 1995; Özgüner & Kendleb, 2006). As pointed out by Nassauer (1997), everyday landscapes are judged by an “aesthetic of care” or the manipulation they receive, as compared with other landscapes that are regarded as beautiful against aesthetic scenic standards.

The findings reflect the complexity of people’s responses to urban open spaces and appeal for balanced strategies in the practice of neighborhood parks. The significant and positive relationships between perceived uniqueness of natural design features and park meanings and park identity as identified in this study suggest that the types of natural design elements used and the way they are organized can have significant contributions to the development of park attachment. Considering the distinct climatic and geographic context of this region, introduction of native plant species in urban and neighborhood parks in a way simulating the natural presence of the indigenous vegetation not only can promote environmentally sound landscaping practices to preserve urban biodiversity (Johnson, 2004), but also can contribute to the formation of a unique landscape character which may lead to the development of a strong place identity among users, and furthermore, to the building of the nation’s symbolic landscape, which in Meinig’s (1979, p. 164) words, is the iconography of nationhood, the shared set of ideas and memories and feelings which bind a people together, a “tropical garden city”. On the other hand, the pursuit for naturalistic landscape does not deny the values of more formal landscapes. Carefully balanced design and management strategies that incorporate both natural and landmark built features and naturalistic and formal spatial patterns in park landscape design should be implemented so that evidence of care, clear spatial orientation, and a sense of order can also be perceived when people are enjoying the natural environment. For instance, as suggested in landscape preference research, more naturalistic landscape can be introduced into parks and green spaces without necessarily leading to a feeling of insecurity if the edge condition and the spatial arrangement of the natural design features are properly handled (Jorgensen, Hitchmough, & Calvert, 2002). Some also suggest that the periphery of a natural area should be zoned for more refined management, such as mowing grass along the edges of walks and trimming dense shrubs, to make it more acceptable to key users, and let nature take its course within the natural zone (Ryan, 2000).

It is important to note that the formal/natural categorical division of landscape design here was only based on the results of factor analysis of the design elements discussed in this study and should not be used arbitrarily as an absolute way of classifying landscape. Alternative landscape categories of different characters might be identified that also contribute significantly to park attachment if different design elements of different nature are included in analysis in other research contexts. For example, the effects of historical and cultural landscape elements on park attachment were not explored in this study, since the three parks under study do not contain any of these design features. Previous research has demonstrated that cultural and historical landscape contents were highly appreciated and identified with by people and that other than natural environment and social networks, a region’s cultural landscape, cultural values and local history were also among the factors that account for local residents’ place attachment. (Kaltenborn & Bjerke, 2002; Kaltenborn & Williams, 2002). This study also found that residents, especially those who had relatively high and medium level of attachment to

neighborhood park, held fairly positive attitudes towards design and management strategies that encourage the creation of landscapes delivering cultural and historical messages and supporting art activities (Table 4. 37, Table 5. 26). However, currently the majority of the neighborhood parks are designed mainly based on aesthetic and functional considerations and few have involved historical-cultural considerations into the landscape designed[32]. Considering the multiracial nature of Singapore's public housing population, the multi-cultural character of the society, and the city's rapid and drastic physical and social transformation from a fishing port characterized by Kampong (the village) houses to an urbanized international metropolitan, planners and designers should be encouraged to diversify their design strategies, base their rationale on and derive their inspirations from this multifaceted sociocultural-historical milieu, and respond sensitively to the environment so that the unique and rich social, cultural, and historical information and knowledge embedded in the design context can be extracted and translated in an innovative way into park landscapes that can be easily grasped by the general public. In view of the fact that government authorities have already recognized the importance and necessity to "strengthen the heritage of individual Towns and promote heritage awareness among residents" in an attempt to create distinct town character (Forum on HDB Heartware, 2007), it is hoped that this culture-history-sensitive approach may enhance residents' understanding, appreciation, and identification with the meanings symbolized by the park landscape and further strengthen their emotional tie with the park and the neighborhood in which they live.

Toward experience-oriented open space planning and design strategies

This study has found that passive recreation had both direct effects and indirect effects mediated via identification with park meanings on park attachment. Family-oriented recreation also had independent direct effects on park caring dimension. However, active recreation had neither direct nor indirect effects on all three park attachment dimensions. These findings suggest that active recreation seems to have no significant influence on the formation of attachment, whereas non-active recreation might be a strong source of emotional bonding.

However, the current neighbourhood-level upgrade proposals seem to be primarily hardware-oriented and include only architectural design features and some specific types of recreation facilities[33]. These items are attributed with high priority because they are regarded to be most relevant to residents' leisure activities and be in most dire needs of renew. Undoubtedly, positive effects of the renewal of these items on residents' level of satisfaction will be obvious. But it is not clear whether this will contribute to a stronger attachment feeling among residents.

The results of this study imply that planners and designers need to pay more attention to support non-active leisure activities because they may have greater potential to foster

[32] Although such initiative can be seen in some of the existing town gardens and region parks, such as Bukit Batok nature park where abandoned quarry was included into park landscape and Ang Mo Kio Town Garden East where rubber trees were planted to reflect the historical land use and the rural character of the area, such effort is rare in neighborhood parks. Among the neighborhood parks listed in Appendix A, only one park, Teck Whye garden in Chua Chu Kang neighborhood one, was found to be designed with cultural implications by imitating geometric landscape pattern and architectural elements typical in Indian courtyard gardens.

[33] Items to be renewed include drop-off porch, covered linkways, playground, footpaths, fitness corner, jogging track, barbeque pits, skating park, street soccer court, tennis court, etc., as suggested by the HDB authority. (Source: http://www.hdb.gov.sg/fi10/fi10208p.nsf/WPDis/Neighbourhood%20Renewal%20ProgrammePolicies?OpenDocument)

attachment among recreationists. Therefore, the objectives of open space development in public housing are far more than just allocating land and distributing facilities, but to create diverse recreation experiences. Open space planning and design may need to adjust its sole accent on the current facility-oriented approaches, which stress more the provision of recreation facilities based on certain planning standards formulated basically according to active recreation needs of a certain amount of population only, and balance its' strategies by emphasizing more on experience-oriented approaches, which focus on the creation of a refreshing total environment and a distinctive atmosphere catering to the unique experiences sought by non-active recreation. The unique park environmental experiences depend more on the effects of the spatial configuration of various landscape design features and less on quantifiable recreation hardware, thus posing a greater challenge to planners and designers.

The importance of neighborhood parks in public housing development

Previous place attachment studies mainly focused on large scale outdoor recreation settings such as hiking trails and national park (Kyle, Bricker, et al., 2004; Kyle, Graefe, & Manning, 2004; Kyle, et al., 2005; Kyle, Graefe, et al., 2003; Kyle, Graefe, Manning, et al., 2004a; Williams, et al., 1992). Studies conducted in residential context were limited to low-rise low density housing areas (Jorgensen & Stedman, 2001; Kaltenborn, 1997; Stedman, 2000). This study represents the first attempt to explore the phenomenon of place attachment in public housing context. New empirical data were collected and the results indicate that public housing residents did feel attached to nearby neighborhood parks within inner city neighborhood areas, although the participants' responses to the subdimensions of attachment varied. Thus, the evidence here demonstrates that people can develop attachment not only to large scale outdoor recreational settings dominated by splendid landscapes or low density rural residential areas chosen as places to escape the chaotic urban life, but also to nearby open spaces situated in densely populated inner-city public housing areas that are integral parts of the urban residential environment and that are closely connected with their everyday life.

More importantly, this study has found a strong and positive association between attachment to nearby neighborhood park and attachment to neighborhood, suggesting that nearby open spaces in public housing do matter a lot to residents and their successfulness as indicated by residents' degree of attachment to them may have substantial influence on residents' emotional bonding to their own neighborhood. In line with previous research that has found that well managed green common spaces play a pivotal role in building a healthy social ecosystem in inner-city public housing neighborhoods by encouraging residents' uses, promoting social interactions, enhancing sense of safety, improving mental functioning, increasing level of satisfaction, and thus contributing to a greater social cohesion of the community (Coley, et al., 1997; Kuo, 2001; Kuo, Bacaicoa, et al., 1998; Kuo, Sullivan, et al., 1998; Kweon, et al., 1998; Taylor, Kuo, & Sullivan, 2001), the findings here further highlight the validity and importance of the development of recreational open space in residential areas by revealing the unique faculty of open space in fostering sense of community and furthermore, sense of belonging among residents, which is one of the most important objectives of community planning (Keller, 1968). The important implication to public housing development, especially those decaying inner city public housing areas where there is a dire need for innovative design and management

strategies that may help to consolidate the community and bring life back to the neighborhoods, lies in that natural open spaces are not trivial resources but can be utilized as catalyzing planning elements in terms of facilitating community-building and residents' attachment to these settings can be used as positive force for promoting neighborhood revitalization (Brown, Perkins, & Brown, 2003) because the emotional attachment residents have to these settings may strengthen their tie with the neighborhood in which they live.

The findings here also offer implications to public housing environmental design that nearby open spaces can be used as effective planning components to create a distinct place identity. Since 1980s, lots of efforts have been made by the HDB authority to break the uniform and monotonous images of the early public housing estates through experimenting with various planning concepts and design elements to endow new towns with "character and identity". The effectiveness of the architectural features and planning strategies as implemented in the current practices of HDB new towns on creating a sense of identity and fostering emotional affective bonds among public housing residents has been examined elsewhere (Teo & Huang, 1996; Teo, 1996), and the results indicate that macro-level planning elements (namely, distinctive skylines, block designs, town parks and town centres) were relatively more successful on rendering character to new towns than human scale planning elements (namely, precinct and flat design). This study supports these early findings by suggesting that nearby open spaces such as neighborhood parks might be as equally effective as other planning and architectural elements in creating a unique neighborhood individuality and thus contributing to a sense of place and community, and their strength lies in their great potential of creating a strong visual identity and accommodating a variety of recreation experiences.

The significant role that neighborhood parks play in the formation of neighborhood attachment and their significantly higher level of usage compared with the other types of urban and neighborhood open spaces (Table 4. 8, Table 4. 9) as identified in this study also raise the concern about the latest generation of HDB new town planning model in which neighborhood park does not seem to assume a position in the open space hierarchical structure any more. For example, in the "Punggol 21 new town" under construction (Figure 6. 1), precincts as planning units have been replaced by more compact "estates", and neighborhood-level open spaces such as neighborhood parks have been substituted by smaller common green areas, ranging from 0.4 to 0.7 ha, distributed evenly in a finer spatial grid composed by the "estates" across the whole town. Although the planning rationale behind is said to be that smaller building clusters will encourage more social encounters and thus contribute to a stronger sense of territoriality, sense of identity, and ultimately, sense of community, local research (Hee, 2002) has questioned the validity and effectiveness of this type of planning model and pointed out that it may lead to a fragmentation and isolation of public spaces and the "shrunk" common green area within each estate may have low flexibility in use after locating the required built in equipment and furniture designated for specific recreation activities. Past research also found that moderately sized open spaces are more preferred in terms of diversity in visual and recreational environments (Joardar, 1989). It is argued here that compared to the proposed small scale estate common green areas, which are spatially confined and functionally limited, and large scale regional parks or town gardens, which are relatively less easy to access,

medium scale neighborhood parks are more convenient and more competent in that they have greater flexibility in accommodating a balanced design proposal that incorporates both naturalistic and formal landscapes and providing support for both active and passive recreation. Therefore, neighborhood parks have greater potential to nurture a diverse range of meanings and to foster positive emotional bonds among residents. In other words, the advantages provided by neighborhood parks seem to be unique and irreplaceable and may even surpass that of the other types of neighborhood open spaces. This implies that there is an urgent need to reevaluate the current public housing new town planning model and reaffirm the strategic role of neighborhood park in the open space hierarchy. Further research is needed to investigate the differences between residents' attachments to different types of neighborhood open spaces and examine the validity and effectiveness of the authority's planning efforts to reduce the scale of user catchments into more socially meaningful levels (Teo & Huang, 1996).

Figure 6. 1 Land use plan of Punggol 21 new town and illustrative layout of a typical estate and common green

(Source: Punggol 21 - A waterfront town of the 21st century. Singapore)

The importance of public involvement

Other than exploring the nature and sources of place attachment, this study also identified that residents' attitudes toward park design and management varied and their responses to negative park environmental changes were strong, and that residents' level of attachment did account for the variances in their attitudinal inclinations and behavioral intentions. Besides, the association

between level park attachment and willingness of participation in park-oriented activities was found to be the strongest (Table 5. 26). These findings confirm the attitudinal and behavioral implications of place attachment and are consistent with previous research that level of attachment does influence people's management preferences specific to a place (Kaltenborn & Williams, 2002) and their willingness to engage in place-protective behaviors (Stedman, 2002). Moreover, the results here underline the importance and necessity of public participation in the decision-making process of neighborhood open space planning and the utility of place attachment study in the process. This is particularly relevant to the current HDB new town planning and especially the on-going Neighborhood Renewal Programme in which public consultation has been given substantial attention[34].

Why public participation? As suggested by previous research, the general public and experts usually hold different perceptions and opinions towards a specific environment, and a lot of conflicts related to environmental management can be attributed to this discrepancy (Francis, 1987; Ryan, 1997, 2005). Engaging the public is regarded as an essential way to recognize that experts and affected groups have different knowledge, perceptions, and needs (Kaplan, Kaplan, & Ryan, 1998) and to ensure the proposed design and management decisions are responsive to a wide range of viewpoints (Ryan, 2005). Also, HDB was said to have taken an "outsider's" view of place and has not been sufficiently sensitive to the "insider's" perspective. The "top-down" approach, governed by the criteria of efficiency, pragmatism and orderly growth, as implied in much of the planning in Singapore has received more and more criticism from the general public, who with rising levels of affluence are increasingly desiring a greater voice in public planning (Teo & Huang, 1996). Participatory design and planning is considered to be able to "restore the balance of power in favor of people who typically have had the least power to effect environmental decision-making and exert control over the physical settings of their everyday life" (Feldman & Westphal, 1992, p. 34).

The psychological and social benefits obtained from public participation have been discussed in literature (Grese, Kaplan, Ryan, & Buxton, 2000; Hoppner, Frick, & Buchecker, 2007). The importance of obtaining and incorporating public inputs and the ways to do it have also been addressed by scholars (Kaplan, et al., 1998). Several points relevant to the current research context are worthy of emphasizing here.

1) Place attachment study can be used to lay the ground work for public involvement

Other than being used in a post-construction evaluation scenario, as is the case of the current study, place attachment study can be conducted in a more active way to lay the groundwork for public consultation in neighborhood open space planning and other contexts. The framework of place attachment proposed here can be utilized in the initial stage of public involvement to: 1) identity different user groups who are mostly attached and committed to nearby open spaces and those who are most likely to be affected by environmental changes; 2) identify the key locations, characters, or features of a park that are most cherished by individuals or a specific

[34] One of the key objective of Neighborhood Renewal Programme (NRP), as stated by the HDB authority, is "... to involve residents in decision-making on matters affecting their immediate neighbourhood. With NRP, lessees will be invited to participate actively by giving feedback and deciding collectively on the facilities for their precinct at a public forum."(Source:http://www.hdb.gov.sg/fi10/fi10208p.nsf/WPDis/Neighbourhood%20Renewal%20ProgrammeOverview?OpenDocument)

group; 3) identity different patterns of uses, modes of experiences, typologies of environmental perceptions toward and evaluations of the park environment, as well as other contributing factors that may affect park attachment; 4) identity the range and nature of the dominant meanings of the park that are shared by residents; 5) identity different attitudes towards park design and management held by residents and professionals; 6) identity the extent of possible psychological and behavioral impacts of park environmental changes on residents; and 7) identify potential volunteers who have the strongest intention of commitment and individuals or groups who are necessary to be brought into public consultation.

By providing a wider and clearer picture of the relationship between people and place as well as identifying the differences between the general public and professionals' preferences towards environmental design and management, place attachment study can facilitate public involvement by prioritizing issues for discussion, preparing relevant materials for communication in a readily understandable way, and providing information to the design and management proposals waiting for feedback from the public. It can also allow for validation, expansion, or adjustment of the existing theoretical framework concerning people-place relationships based on the empirical data collected.

2) Participatory planning and design should be conducted in a case-based way

Considering the diversity of neighborhood parks and other types of open spaces in HDB new towns and the non-identical socio-demographic profile of each neighborhood, it may not be appropriate to impose a universal and homogenous management plan across different neighborhoods that ignores the particularity of each estate and the specificity of the problems each of them is facing. Therefore, participatory planning and design should be carried out on a case-by-case basis in that by probing local residents' own opinions on what specific aspects of their neighborhood environment and how these aspects should be improved, contextualized solutions and site-specific design and management strategies can be put forward that will cater to their specific needs and expectations. It is hoped that this will help "foster a sense of belonging to, and pride for, their precincts/neighbourhoods while, at the same time, the character of new towns will be further enhanced as each takes on meaning from the residents living within it" (Teo, 1996, p. 292).

3) Participatory community garden project can be an effective way to foster park attachment and further neighborhood attachment

Various forms of public consultation have been proposed for the on-going neighbourhood upgrade program, such as public exhibition, town hall meeting, residential survey, and dialogue sessions. The recent "Remaking Our Heartland" exhibition (Figure 6. 2) on planning and design proposals concerning "Realizing the Vision for New Estates, Regenerating Old Estates and Rejuvenating Communities in Middle-Aged Estates" has generated a great deal of excitement and the enthusiastic responses it received demonstrate the public's eagerness and willingness to be involved in the decision-making process of their own living environment (Housing and Development Board, 2007, Nov).

Figure 6. 2 Public exhibition: “Remaking Our Heartland”
(Source: photograph taken by the author on Oct 2, 2007)

As revealed by the survey accompanying the exhibition, fairly positive feedback has been obtained from the public. Specifically, strong support was received for the proposals related to open space planning: 55% of respondents supported having sports facilities within a park setting; 63% and 56% of respondents indicated their preference for Sky Gardens and Housing-in-a-Park. More surprisingly, 60% of respondents preferred having a Community Green and around 90% of respondents expressed willingness to help maintain the Community Green (Housing and Development Board, 2007, Nov). These results are in accordance with the findings of this study: among the proposed four forms of neighborhood participation, respondents were most willing to work in community gardens (Table 4. 40).

This is congruent with previous research suggesting that residents with high levels of place attachment may be willing to put in the hard work and sustained efforts needed for revitalization (Brown, Brown, & Perkins, 2004), and that residents’ participation in open space design and management may contribute to the formation of sense of community (Kuo, Sullivan, et al., 1998). Research conducted in inner-city neighborhoods has demonstrated that community open spaces were highly valued by their users and neighborhood residents (Francis, et al., 1981), and that urban gardening activities not only bring a lot of psychological benefits (Kaplan, 1973), but also can help people to develop a sense of well being and satisfaction, increase their self esteem, and become more involved in their communities (Lewis, 1979). Some also noted that community garden is a socially desirable provision which will draw certain groups in the use of recreational open space who would not otherwise use a park (Francis, 1987). Besides, the spatial capacity of neighborhood parks guaranties that other than providing customizable planting plots for gardening activities, community gardens can also be planned with educational functions to deliver environmental knowledge and enhance environmental consciousness (Cranz & Boland, 2004).

The significance of community gardens as cited above and the findings here suggest that other

than consulting the public in the form of public meeting, direct involvement of residents in the design, construction, and management of neighborhood open spaces in the form of community garden project may feature a productive approach to foster park attachment and further, neighborhood attachment. With the necessary technical and organizational support from professionals, residents' direct involvement in community gardens within neighborhood parks may fasten the emotional connection between them and turn these nearby open spaces from places people take for granted to places that are undetachable from their everyday life. Decision-maker and designers should take into account the great potential of community gardens and facilitate the initiation and maintenance of these user-developed and managed open spaces. The recent "Community in Bloom" programme (Figure 6. 3) organized by the National Parks Board can be seen as an active step forward taken by the authorities along this line of thought. By encouraging individuals in the community to take initiative and responsibility for organizing, planting and maintaining the gardens, these open spaces may become focal points for local social interaction and anchors of community attachment.

Figure 6. 3 Community in Bloom programme

(Source: http://www.nparks.gov.sg/cib_award.asp)

6.4. Limitations and Suggestions for Further Research

This study explored the phenomenon of place attachment through quantitative analyses with data collected from only a section of the population in a specific socio-physical context: Singapore's public housing residents living near neighborhood parks. Therefore, caution must be taken to interpret the findings obtained from this study. It may not be appropriate to generalize the findings of this study to other groups or areas without taking into account the specific conditions of the context. Further research should be conducted based on a full understanding of the limitations of this study.

Model examination

This study has demonstrated the advantages of structural equation modeling technique in place attachment study by showing its utility in 1) confirmatory factor analysis which was used to compare the superiority between hypothesized dimensional models; 2) invariance test which was used to examine the invariability of model across different groups; 3) path analysis which was used to examine effects of a group of independent variables on several latent dependent variables; and 4) mediation analysis which was used to examine the mediating effect of a key variable. However, several issues that were not well addressed or that are not explored in this study should be paid more attention to in future research.

1) Alternative measurement items for place caring dimension

Although the discriminant validity, or the extent to which a factor is different from the others, of place caring as a distinct dimension of place attachment was supported in this study as indicated by its relatively lower correlation with the other two dimensions, the convergent validity, or degree of the correlation between the factor and its measurement items, of this dimension was not so satisfying because the factor loadings of the five measurement items were relatively low compared with that of the other two dimensions (Figure 5. 7). Therefore, the current items used to measure place caring need to be refined and alternative items need to be structured and tested in future research in order to achieve a better representation of this dimension.

2) Alternative dimensional model of place attachment

This study confirms that the correlated-three-factor model, which suggests that place attachment is composed of place caring, place dependence, and place identity dimensions, exhibits the best fit to the data collected. However, this does not deny the possibility that there might be other component dimensions and other structural models that provide better explanations of the dimensionality of place attachment. For example, some (Moore & Graefe, 1994; Williams & Roggenbuck, 1989) have pointed out the similarity between place attachment dimensions and some of the modes of environment experiences proposed by Ittelson and colleagues (1976): place identity, which represents the extent to which a place is perceived as a central aspect of self-identity, is close to experiencing a setting as self, and place dependence, which represents subjects' functional reliance on a place, seems to be counterpart of experiencing the setting as one for action. Considering the complexity of the phenomenon of place attachment, this study can be said to have provided one tenable explanation of the dimensionality of this construct. Further research is needed to test whether the place attachment has other subcomponents and whether the dimensional structure of place attachment can be theorized in alternative ways.

3) Alternative mediators

This study has provided substantial evidence that place attachment is a meaning-based concept by revealing that identification with place meanings plays a significant mediating role in the relationship between proposed predictor variables and place attachment dimensions. However, the fact that place meaning was a partial mediator in some circumstance suggests that there might be other mediators that also can affect the development of place attachment. Future research needs to explore whether there're alternative mediators that were omitted in this study that also underlie the mechanism of place attachment.

4) Differentiating impacts of place attachment dimensions

Although the impacts of place attachment on attitudes and behavior were confirmed in this study, the general place attachment scale derived from cluster analysis is limited in that it is incapable to inform us the differences regarding the effects of each place attachment dimension. For example, those feel attached to neighborhood park mainly due to their functional reliance on facilities in the park may be more likely to favor and feel less annoyed by design and management strategies that emphasize support for active recreation and encourage the reduction of natural design features than do those attached people who attribute the unique natural environment of neighborhood as symbolizing their self-identities. Therefore, further research is needed to differentiate the attitudinal and behavioral implications of each of the place attachment dimensions.

5) Full structural equation model examination

The full connection between the cognitive, affective, and conative components of place attachment was not addressed in this study because the number of sample was relatively insufficient considering the large number of parameters to be estimated in the full relationship model. Also, the relationships between the cognitive factors, such as that between experiential, perceptual, and evaluative variables, were not theorized and analyzed in this study. Further research is needed to investigate the phenomenon of place attachment by including its components in a full structural model. For example, it is very likely that younger residents (demographic factor) who have frequent active recreation in the park (experiential factor) may tend to perceive the facilities and associated park design features as unique and important to their use (perceptual factor) and give positive evaluation to the quality of park facilities (evaluative factor). This may strengthen their agreement with the meaning of the park as an ideal place for recreation (meaning domain). Consequently, they may feel deeply attached to the park and this attachment is represented by a strong functional reliance on park that is regarded as irreplaceable for their pursuit of recreation needs (place dependence). These place dependent residents may tend to express positive attitudes to design and management strategies that will facilitate active recreation (attitudinal implication), and they may be more likely to become active to oppose changes that may disturb their recreation activities (behavioral implication). On the other hand, it also might be the case that elderly residents (demographic factor) who like to have passive recreation in the park (experiential factor) are more appreciative of the natural environment of the park and regard the naturalistic design features as creating unique character distinct from the other parks (perceptual factor), and an accompanying positive evaluation of the

natural quality of the park is expectable (evaluative factor). As a result, they might be more likely to agree that the park is an urban forest which, in combination with the other components of the urban green network, symbolizes the nation's image of a "Garden City" (meaning domain). Consequently, an attachment to the park based on the significant contributions of the unique characteristics of its natural environment to one's self-identity (place identity) may develop among them. Due to the strong self-identity in relation to the natural environment of the park, these residents are expected to be more supportive to design and management strategies that encourage the creation and nurture of naturalistic landscape (attitudinal implication), and they might be more likely to engage in place-protective activities to fight against changes that are perceived to be detrimental to the unique quality and character of the natural environment of their neighborhood park (behavioral implication). The hypothetical causal relationships as illustrated above suggest that by differentiating the subcomponets of each concept domain of place attachment phenomenon and analyze the relationships between them simultaneously in a full model, a more detailed picture regarding the interwoven processes involved in this phenomenon might be obtained (Figure 6. 4).

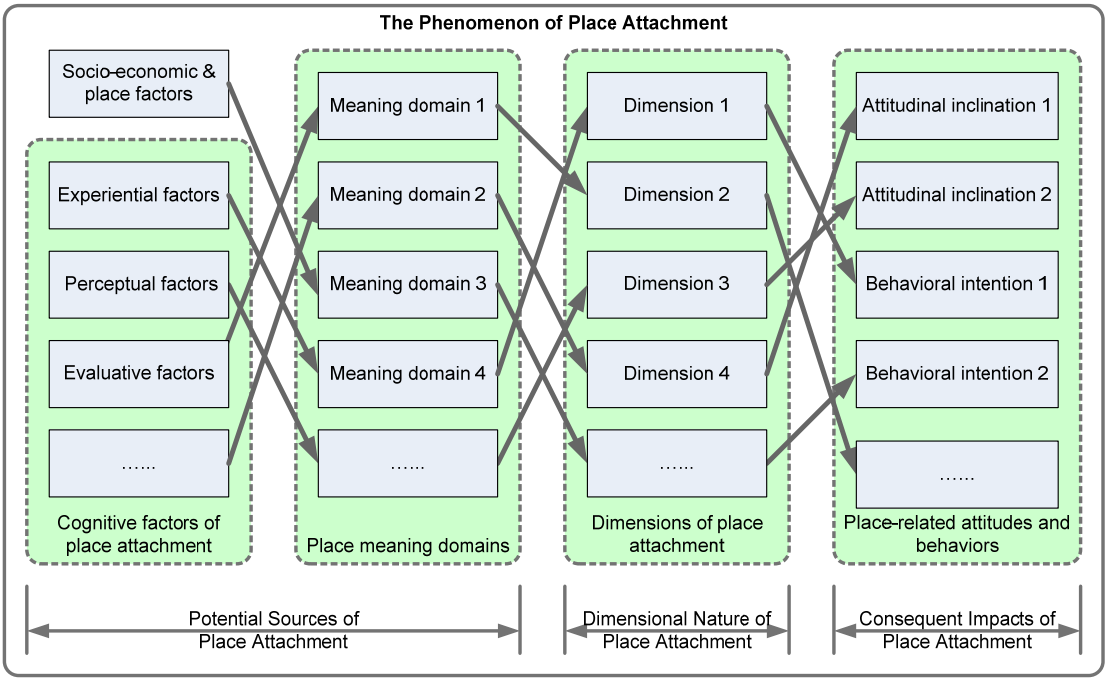


Figure 6. 4 A hypothetical diagram delineating a much detailed picture of the phenomenon of place attachment

6) Feedback model need to be examined

This study only proposed recursive models to examine the effects of hypothesized effects of predictor variables on place attachment as well as the mediating effects of place meaning. It is very likely that the formation of place attachment will exert feedback effects on the factors affecting it. For example, passive recreation may enhance one's park attachment which in turn may encourage more passive recreation and other types of park activities, thus resulting in a self-reinforcing virtuous cycle represented by an ever-increasing level of park usage and an

ever-growing strength of attachment feeling to park. Therefore, future research needs to propose non-recursive models to examine the reciprocal effects of the constructs involved in place attachment phenomenon.

Temporal dimension

The current research is a cross-sectional study in nature in that it explored the phenomenon of place attachment with data collected at a short period of time. Since place attachment is an ever-changing, dynamic psychological process, temporal dimension should be considered in future research. For example, longitudinal study can help us to track the evolution of place attachment and determine whether the pattern of relationships between a specific group of people and a place remains consistent and what the factors are that might affect the change of place attachment over time. Comparative study focusing on contrasting place attachment before and after environmental changes such as neighborhood park renovation can also help to provide us information on how people's place attachment may transform in response to environmental changes.

Landscape Sampling

This study has found that homogeneity of the characteristic of the physical environment of a place might be a factor that affects attachment to the place. However, it is likely that this is an artifact of the park sampling process implemented in this study since only three most representative types of park landscape were identified and analyzed. In the future, a more thorough survey of neighborhood parks or other types of residential open spaces should be conducted so that a more stratified landscape typology can be identified. Examining whether place attachment may vary across this wider range of landscapes may provide further insights into the relationships between place characteristics and place attachment and inform us what kind of landscape has more potential to nurture positive emotional bonds among its users. In terms of the landscape sampling, the bias due to the expert-choosing approach adopted in this study might be mitigated in future study by involving survey subjects in the process, for example, using visitor employed photography (Stedman, Beckley, Wallace, & Ambard, 2004), to inventory the most representative landscapes from the users' perspective. In addition, effect of panoramic images as photographic surrogates for the actual landscape that as suggested by some, capture the surrounding environment of specific locations in a more continuous way (Rogge, Nevens, & Gulinck, 2007), should also be examined in future research.

Research contexts

This study focuses on investigating public housing residents' attachment to nearby neighborhood parks. However, people's emotional bonding may extend beyond the immediate environment and encompass a broad range of physical settings, such as new town level open spaces, specific urban public spaces, and nature reservoirs. Therefore, greater heterogeneity in study context is required in future research so that the validity of the theoretical framework proposed and the effectiveness of the instruments used here can be further tested across different types of physical settings and much comprehensive understanding of the nature of human-place bonding can be obtained (Manzo, 2003).

Qualitative + quantitative methods

Although quantitative analysis methods were used in this study for the purpose of stringent hypotheses examination, this does not deny the value of qualitative methods in place attachment research. Actually, it must be acknowledged that some of the key concepts related to place attachment and the theorizations of the relationships between them were derived from previous research using qualitative methods. In future research, qualitative approach can be used as complementary to the current methodology. Semi-structured interviews and first-hand observation of behavior and interactions can be used in the initial stage of a study to gain a deeper understanding of the relationship between people and place and identify the key constructs to be involved in quantitative analyses. As suggested by Brandenburg and Carroll (1995), the insights accumulated through the observation-by-observation exploration may help to "recognize nuances of attitudes and behaviors that might escape researchers using other methods" and finally lead to "a more intricate model that accounts for unexpected findings". Therefore, qualitative methods can be incorporated in future research to lay the ground work for quantitative analyses.

6.5. Conclusion

Using nearby neighborhood parks in public housing areas as research settings and residents as subjects, this study has contributed to our understanding of the phenomenon of place attachment and people-place relationships through demonstrating the utility of the proposed tripartite theoretical framework of place attachment on guiding the investigation of the nature, sources, and impacts of this construct.

By confirming that place attachment is composed of three dimensions, i.e. place caring, place dependence, and place identity, this study provided evidence to support the multidimensional nature of this construct and raised concerns over the validity of unidimensional theorization and operationalization of this multifaceted concept. More importantly, this study confirmed the crucial role place meaning plays in the mechanism underlying the development of place attachment by providing evidence to support the notion that place attachment is a meaning-based concept in that identification with place meanings not only has strong and significant direct contributions to all the attachment dimensions, but also mediates the effects of other predictor variables of place attachment, either partially or completely, thus emphasizing the importance of understanding people's responses to the meanings held by a place in understanding their attachment to that place.

The findings here offer important practical implications by suggesting that open space planners, designers, and managers should pay more attention to older people's recreation needs to sustain and enhance their attachment to nearby open spaces. Balanced landscape design strategies are needed to respond to people's appeal for naturalistic landscape and their longing for signs of human intention to care for the landscape, since both of them may contribute to place attachment. The results also stress the need to shift from the current facility-provision-oriented approaches in open space design to experience-creation-oriented

ones in that the latter may have greater potential to foster place attachment. By revealing the significant contribution of neighborhood parks to neighborhood attachment and their greater potential in nurturing attachment feelings, this study further confirms the validity and utility of neighborhood parks in community-building and neighborhood revitalization in public housing areas and questions the soundness of the current new town planning model in Singapore which ignores the development of medium-scale open spaces. Finally, the results highlight the necessity of public involvement in neighborhood open space planning and the utility of place attachment study in this process. It is suggested that direct involvement of residents in the design and management in the form of community garden may feature an effective way to strengthen the emotional connection between residents and neighborhood parks and further, sense of community.

It is also emphasized that cautions must be taken when interpreting and generalizing the research findings here. Based on understanding of the limitations of this study, directions for future research are also suggested, such as refining sampling procedures and measurement instrument, testing alternative structural models, examining the temporal dimension, investigating new research contexts, and incorporating qualitative methods.

Epilogue

On approaching the end of this research, one article (Figure 6. 5) printed in a local newspaper caught the author's attention, in which several local residents were complaining about an un-consulted demolishing of two matured casuarinas trees adjacent to their flats that they regarded as unique and characterizing their neighborhood and took a lot of pride of. Although the related agency quickly responded to the public on the next day and explained that the trees were cut down due to horticultural and public safety concerns, it seems that the authority did not inform the local residents the environmental change in advance and listen to their voices before carrying out the removal, and further actions on how to replant the area and rebuild the lost connection between residents and the nearby natural environment was also not mentioned. The explicitly expressed grief caused by removal of just a few trees as reported in the news echoes the grieving feeling for a lost home as reported in earlier research on forced relocation (Fried, 1984) and further speaks to the main point underlies the current study that people may form a strong emotional connection with the nearby natural environment and that undesirable environmental change, even being relatively small, may endanger this attachment and cause strong negative psychological impacts on people. It reminds us that further research is needed to continue the investigation of the complex nature of the phenomenon of place attachment, and planners, designers, and environment managers should make more efforts to translate the empirical research findings to concrete strategies to foster and maintain the people-place bonding in their practices.

TODAY • Tuesday • February 26, 2008

Voices

A blow to Pasir Ris residents

Felled old trees were pride of quaint neighbourhood

Letter from **ONG SIEW KHIM**

I AM shocked and utterly disappointed at the felling of several old handsome casuarina trees along Elias Road (pictures).

We have been staying here for about 15 years and my family and neighbours take a lot of pride in these majestic willowy trees, which add a lot of character to the quaint neighbourhood.

Even visiting friends and relatives often comment about how beautiful they are. Very often, I look out of the window and spot various breeds of exotic birds resting and feeding on the fruit. They are one of the main reasons why we have chosen to stay here for many years.

So, imagine our horror on Saturday morning when we discovered a team of workers chopping down the trees.

When I approached them to find out why, they asked me to contact the Pasir Ris Town Council, which is closed during the weekend. They also told me they were going to chop down all the casuarina trees.

My family and I are upset that this has happened and hope to hear the justification for this insensitive action. As we are a green garden city, we should have more respect and consideration for residents and our surroundings.

I hope that through this letter, we can prevent more of these trees being felled. It takes just minutes to cut them down, but decades for them to flourish.

NOW YOU SEE 'EM, NOW YOU DON'T

PHOTOS COURTESY ONG SIEW KHIM

They were healthy – why cut them down?

Letter from **DAVID LAW KAH HOCK**

I AM dismayed by the Pasir Ris Town Council's decision to cut down mature and healthy casuarina trees in the area.

For many years, these tall and graceful trees have provided residents shade and comfort. One gets a sense of peace and calm just by looking at them.

Now, two of these gentle giants, each about 14 storeys high, have been cut down.

I do not see a need for such action. Many visitors have said that these beautiful trees give this estate a distinct feel.

I spoke to the contractor in charge and he attested that the trees were very healthy. He, too, is at a loss as to why he was instructed to cut them down.

I am disappointed with the National Parks Board for allowing this to happen. I am sure that without their approval, these trees could not have been felled. Can someone explain why these trees were cut down?

TODAY • Wednesday • February 27, 2008

Removed trees were in poor form

Prone to brittle branches, which could snap and fall on passers-by

Letter from **MICHAEL NGIN**
Public Relations Manager
Pasir Ris-Punggol Town Council

WE REFER to the letters, "Felled old trees were pride of quaint neighbourhood" and "They were healthy – why cut them down?" (Feb 26) by Ms Ong Siew Khim and Mr David Law, on the matter of removing *casuarina equisetifolia* trees along Elias Road.

We would like to thank Ms Ong and Mr Law for their feedback. We understand and share their disappointment over the felling of these trees, but it is essential for us to proceed with the removal in view of public safety.

Casuarinas trees are susceptible to basal/trunk rot and brittle branches. In our routine horticultural maintenance, we have also discovered regular snap branches and hairline cracks on the trunks of these casuarinas. Due to the casuarinas' characteristics, we are also unable to carry out corrective trimming, unlike other trees.

Contrary to the personal opinion offered by our contractor (landscape supervisor), our certified arborists have examined the 27 casuarinas within the mentioned precinct and identified 11 of them in poor form, having bad lean and sited close to pedestrian crossings/footpaths.

Although there is currently no eminent danger, we are taking precautionary measures, which include removal of the trees, to prevent any unfortunate occurrences/incidents to our residents.

You may also wish to know that we have also previously received calls from concerned residents who have witnessed snapping branches and requested for a complete removal of such trees.

However, our arborists' examination has shown that some of them are in good condition, with proper form and structure.

Thus, only those trees which are in poor form and bad lean will be felled.

Figure 6. 5 Articles reporting residents' concern on demolishing of neighborhood trees and authority's response

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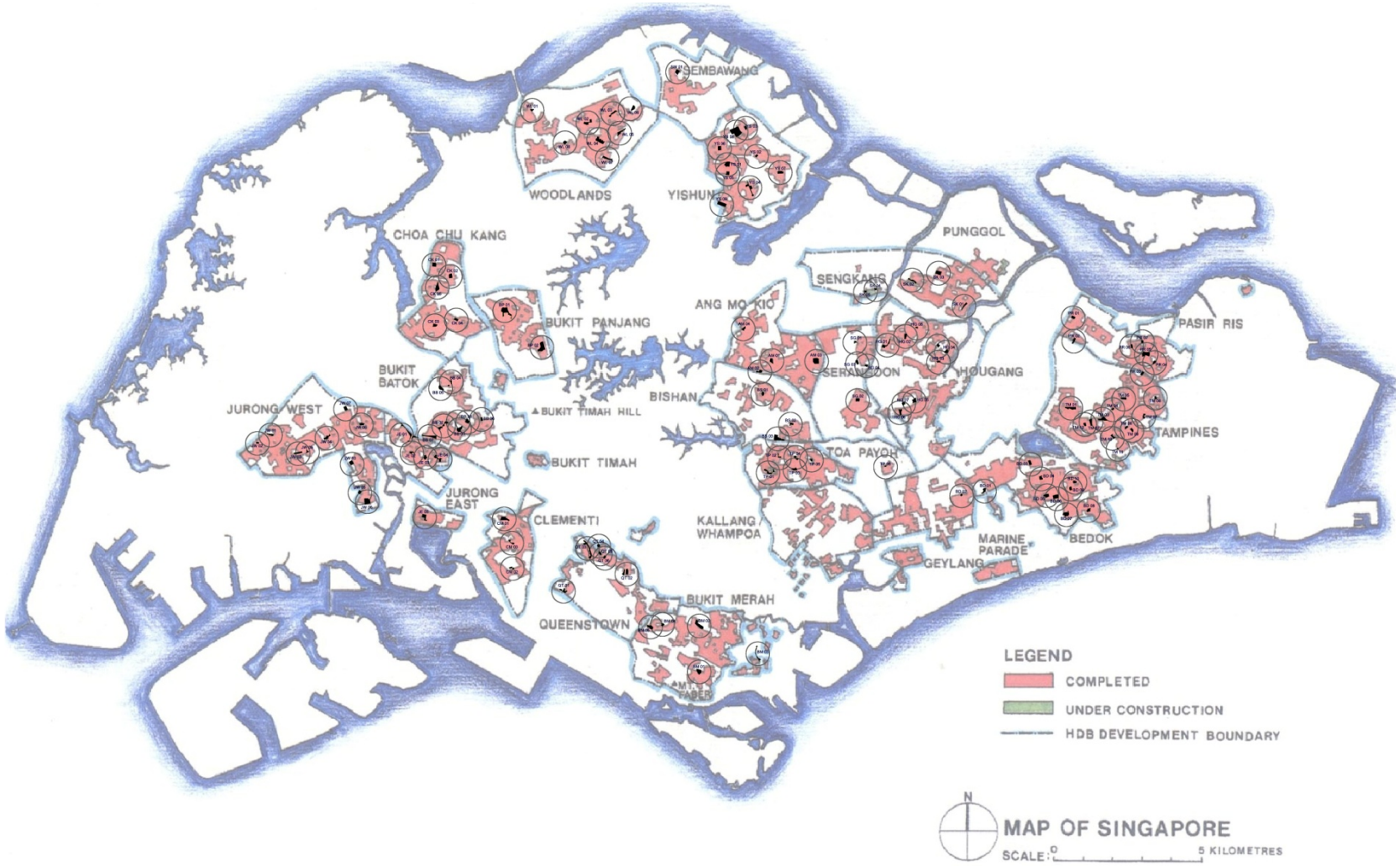
APPENDIX A: HDB NEIGHBORHOOD PARK INVENTORY



Location of Neighborhood Parks

Park Index	HDB New Town	Neighborhood	Catchment Area (ha)	Park Area (ha)	Landscape Typology	Spatial Typology
AM 01	Ang Mo Kio	3	16.0	1.3	vacant	cornered
AM 02	Ang Mo Kio	2	16.8	1.2	geometric	cornered
AM 03	Ang Mo Kio	4	9.2	3.4	natural	cornered
AM 04	Ang Mo Kio	6	15.5	0.9	mixed	one side open
BB 01	Bukit Batok	2	41.0	2.1	natural	cornered
BB 02	Bukit Batok	1	22.4	1.9	natural	linkage
BB 03	Bukit Batok	2	10.6	1.5	natural	cornered
BB 04	Bukit Batok	3	68.6	0.6	geometric	one side open
BB 05	Bukit Batok	3	68.6	1.5	natural	isolated
BB 06	Bukit Batok	2	9.5	0.7	geometric	centred
BB 07	Bukit Batok	1	15.9	2.3	natural	green buffer
BD 01	Bedok	1	36.9	1.3	natural	cornered
BD 02	Bedok	3	24.1	0.4	vacant	cornered
BD 03	Bedok	7	38.9	1.2	vacant	one side open
BD 04	Bedok	5	14.2	1.1	mixed	one side open
BD 05	Bedok	4	15.9	1.6	natural	one side open
BD 06	Bedok	2	17.1	2.2	geometric	one side open
BD 07	Bedok	1	27.7	2.3	vacant	centred
BD 08	Bedok	1	35.6	1.1	vacant	centred
BD 09	Bedok	1	8.5	0.9	geometric	one side open
BD 10	Bedok	1	16.2	0.8	vacant	one side open
BM 01	Bukit Merah	1	15.9	2.1	geometric	cornered
BM 02	Bukit Merah	-	18.1	3.3	natural	isolated
BM 03	Bukit Merah	-	13.0	1.5	natural	linkage
BM 04	Bukit Merah	-	9.2	0.7	vacant	centred
BM 05	Bukit Merah	-	13.8	1.8	mixed	centred
BP 01	Bukit Panjang	5	92.7	4.9	natural	one side open
BP 02	Bukit Panjang	2	4.6	26.1	vacant	cornered
BS 01	Bishan	2	15.0	0.9	geometric	centred
BS 02	Bishan	1	16.6	0.7	natural	centred
BS 03	Bishan	1	36.1	3.6	natural	cornered
CK 01	Chua Chu Kang	6	27.1	1.6	mixed	cornered
CK 02	Chua Chu Kang	7	27.9	1.5	mixed	cornered
CK 03	Chua Chu Kang	2	35.8	1.1	natural	isolated
CK 04	Chua Chu Kang	1	36.4	0.9	geometric	cornered
CK 05	Chua Chu Kang	5	25.1	2.4	geometric	isolated
CM 01	Clementi	3	17.7	2.4	vacant	linkage
CM 02	Clementi	6	10.7	0.7	geometric	centred
CM 03	Clementi	3	17.0	0.8	mixed	green buffer
HG 01	Hougang	6	47.7	1.8	mixed	green buffer

Park Index	HDB New Town	Neighborhood	Catchment Area (ha)	Park Area (ha)	Landscape Typology	Spatial Typology
HG 02	Hougang	6	16.1	1.2	geometric	one side open
HG 03	Hougang	3	25.8	0.5	natural	one side open
HG 04	Hougang	3	25.8	1.1	vacant	centred
HG 05	Hougang	1	6.6	1.6	natural	one side open
HG 06	Hougang	2	28.5	1.4	natural	linkage
HG 07	Hougang	-	-	1.9	natural	centred
HG 08	Hougang	5	17.9	0.4	geometric	one side open
JE 01	Jurong East	3	11.6	2.0	natural	green buffer
JE 02	Jurong East	2	16.3	0.3	natural	one side open
JE 03	Jurong East	2	16.3	1.1	vacant	cornered
JE 04	Jurong East	2	14.2	1.7	mixed	centred
JE 05	Jurong East	4	47.3	1.8	natural	centred
JW 01	Jurong West	8	42.0	0.9	geometric	one side open
JW 02	Jurong West	9	40.9	0.5	geometric	centred
JW 03	Jurong West	6	15.8	1.2	mixed	green buffer
JW 04	Jurong West	1	9.5	1.5	vacant	linkage
JW 05	Jurong West	1	12.0	0.9	mixed	one side open
JW 06	Jurong West	-	-	3.4	mixed	isolated
JW 07	Jurong West	5	33.4	1.6	geometric	one side open
JW 08	Jurong West	4	4.6	1.0	natural	one side open
JW 09	Jurong West	6	8.2	0.5	geometric	linkage
JW 10	Jurong West	3	21.6	1.5	natural	cornered
PR 01	Pasia Ris	7	13.7	0.9	geometric	centred
PR 02	Pasia Ris	7	23.7	1.1	mixed	linkage
PR 03	Pasia Ris	1	28.5	0.9	natural	linkage
PR 04	Pasia Ris	2	32.6	0.7	geometric	one side open
PR 05	Pasia Ris	4	31.9	3.1	mixed	one side open
PR 06	Pasia Ris	4	20.0	0.7	geometric	centred
PR 07	Pasia Ris	4	31.9	0.6	mixed	centred
QT 01	Queenstown	-	9.1	1.5	natural	green buffer
QT 02	Queenstown	-	6.8	0.8	vacant	green buffer
QT 03	Queenstown	-	13.7	3.0	natural	green buffer
QT 04	Queenstown	-	16.3	0.7	mixed	centred
QT 05	Queenstown	-	16.3	0.8	mixed	centred
QT 06	Queenstown	-	11.6	0.6	natural	one side open
SG 01	Serangoon	5	29.6	0.5	mixed	one side open
SG 02	Serangoon	2	14.9	1.2	mixed	one side open
SG 03	Serangoon	1	33.2	1.0	vacant	centred
SG 04	Serangoon	1	33.2	0.6	vacant	linkage
SK 01	Sengkang	1	14.5	1.0	mixed	green buffer

Park Index	HDB New Town	Neighborhood	Catchment Area (ha)	Park Area (ha)	Landscape Typology	Spatial Typology
SK 02	Sengkang	3	11.2	1.2	geometric	linkage
SK 03	Sengkang	2	14.7	2.1	vacant	centred
SK 04	Sengkang	4	9.7	0.4	vacant	linkage
SK 05	Sengkang	4	13.8	0.4	mixed	one side open
SW 01	Sembawang	4	30.8	1.5	vacant	one side open
TM 01	Tampines	8	71.0	2.4	mixed	linkage
TM 02	Tampines	1	27.2	1.5	natural	centred
TM 03	Tampines	1	27.2	2.1	natural	linkage
TM 04	Tampines	2	15.4	0.5	geometric	centred
TM 05	Tampines	4	12.1	1.0	natural	green buffer
TM 06	Tampines	2	26.1	0.6	mixed	linkage
TM 07	Tampines	3	67.0	0.8	natural	linkage
TM 08	Tampines	3	67.0	0.7	vacant	green buffer
TM 09	Tampines	1	25.2	0.8	natural	one side open
TM 10	Tampines	1	25.0	0.9	vacant	linkage
TM 11	Tampines	1	13.7	0.2	vacant	centred
TM 12	Tampines	9	26.5	0.7	mixed	centred
TP 01	Toa Payoh	1	16.8	1.8	geometric	centred
TP 02	Toa Payoh	1	11.0	0.6	mixed	centred
TP 03	Toa Payoh	1	11.5	1.1	vacant	one side open
TP 04	Toa Payoh	1	6.1	0.8	mixed	green buffer
TP 05	Toa Payoh	1	14.1	0.6	mixed	centred
TP 06	Toa Payoh	-	4.7	0.2	vacant	one side open
WL 01	Woodlands	2	10.1	0.6	mixed	linkage
WL 02	Woodlands	8	58.7	19.9	mixed	one side open
WL 03	Woodlands	7	55.3	1.3	mixed	linkage
WL 04	Woodlands	8	22.8	3.2	mixed	cornered
WL 05	Woodlands	6	61.2	1.6	geometric	centred
WL 06	Woodlands	7	50.9	1.4	under construction	isolated
WL 07	Woodlands	5	42.3	1.6	mixed	linkage
WL 08	Woodlands	3	13.8	1.0	mixed	cornered
YS 01	Yishun	7	31.7	2.2	vacant	cornered
YS 02	Yishun	3	16.3	0.6	vacant	centred
YS 03	Yishun	2	49.5	0.7	vacant	centred
YS 04	Yishun	6	41.1	2.6	mixed	linkage
YS 05	Yishun	7	31.7	1.2	vacant	one side open
YS 06	Yishun	1	24.9	1.5	vacant	one side open
YS 07	Yishun	4	18.8	1.5	vacant	cornered
YS 08	Yishun	2	49.5	8.0	natural	isolated
YS 09	Yishun	8	7.0	3.1	natural	cornered

AM 01

BB 02

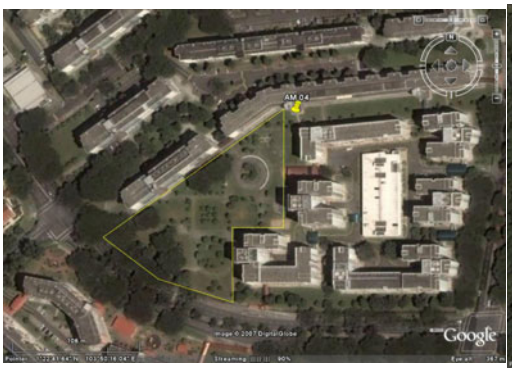
AM 02

BB 03

AM 03

BB 04

AM 04



BB 05

BB 01

BB 06

BB 07

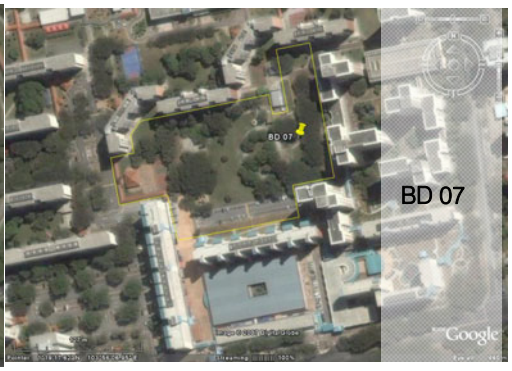
BD 05

BD 01

BD 06

BD 02

BD 07



BD 03

BD 08

BD 04

BD 09

BD 10

BM 05

BM 01

BP 01

BM 02

BP 02

BM 03

BS 01

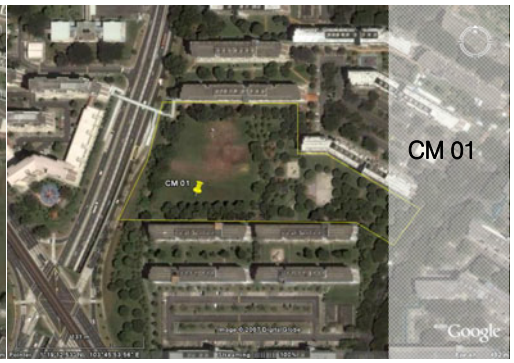
BM 04

BS 02

BS 03

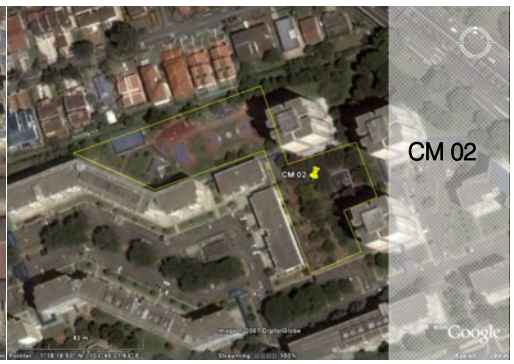
CK 05

CK 01



CM 01

CK 02

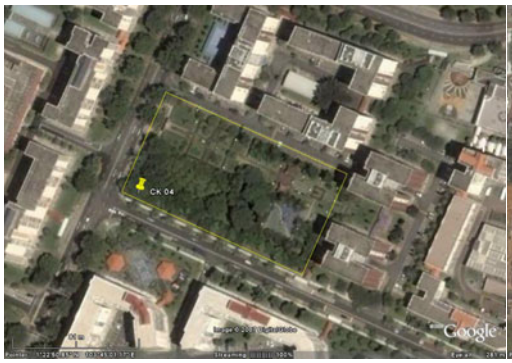


CM 02

CK 03

CM 03

CK 04

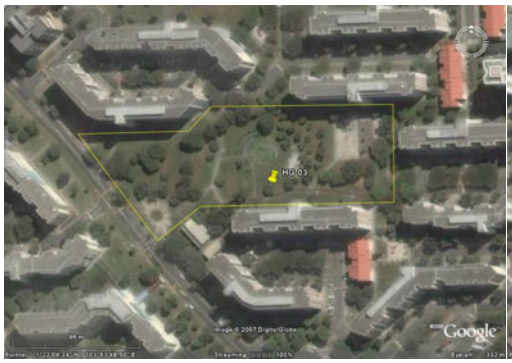


HG 01

HG 02

HG 07

HG 03



HG 08

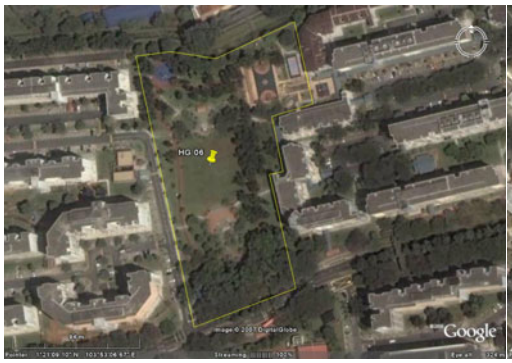
HG 04

JE 01

HG 05

JE 02

HG 06



JE 03

JE 04

JW 04

JE 05

JW 05

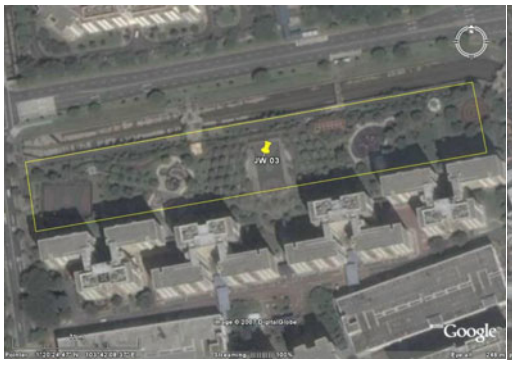
JW 01

JW 06

JW 02

JW 07

JW 03



JW 08

JW 09

PR 04

JW 10

PR 05

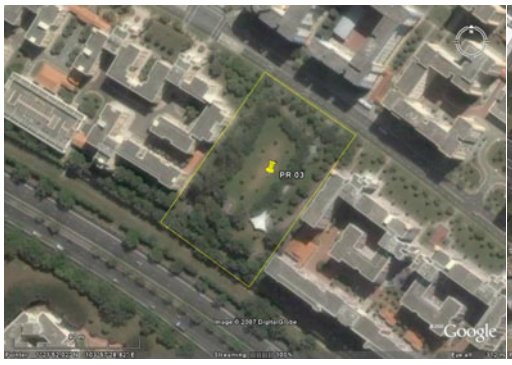
PR 01

PR 06

PR 02

PR 07

PR 03

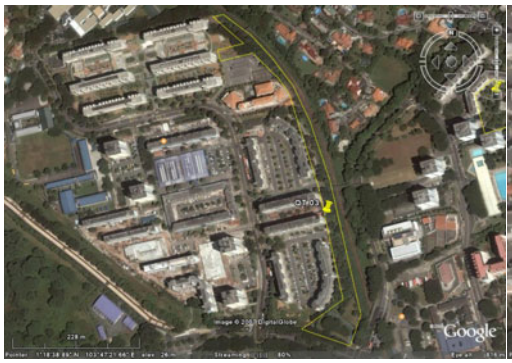


QT 01

QT 02

SG 01

QT 03



SG 02

QT 04

SG 03

QT 05

SG 04

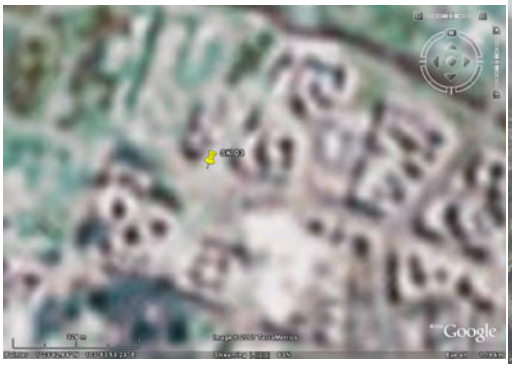
QT 06

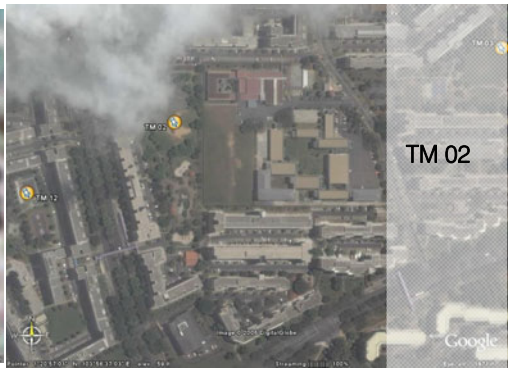
SK 01

SK 02

TM 01

SK 03



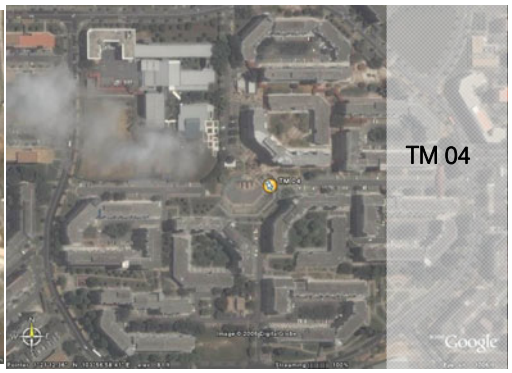


TM 02

SK 04

TM 03

SK 05

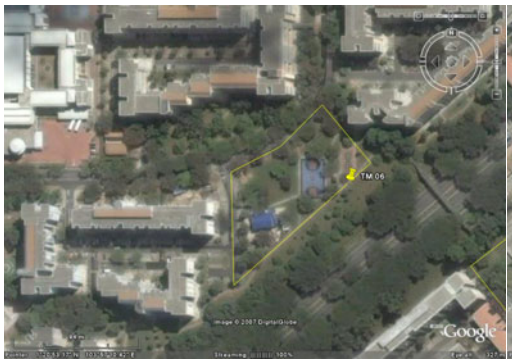


TM 04

SW 01

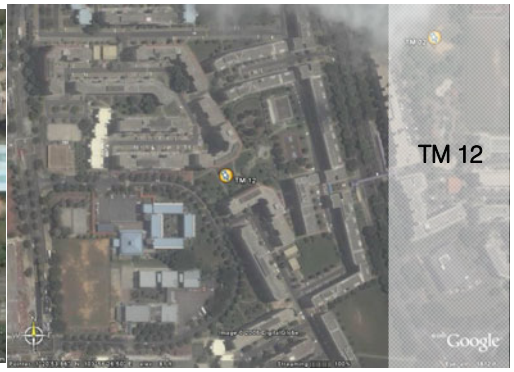
TM 05

TM 06



TM 11

TM 07

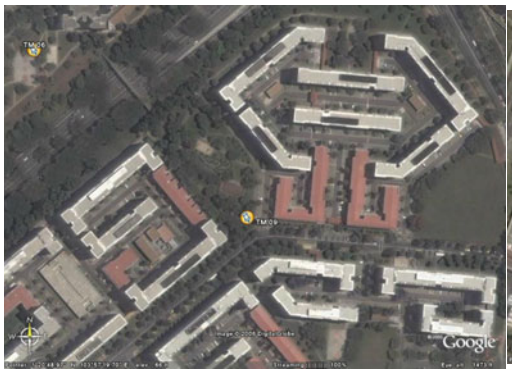


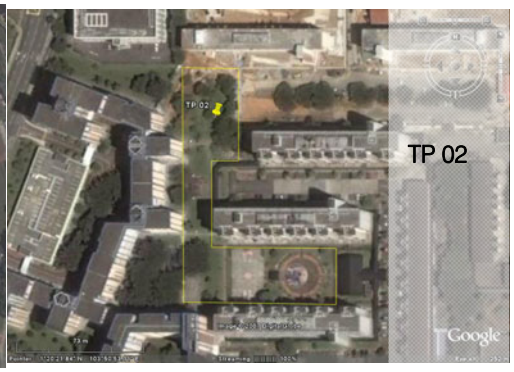
TM 12

TM 08

TP 01

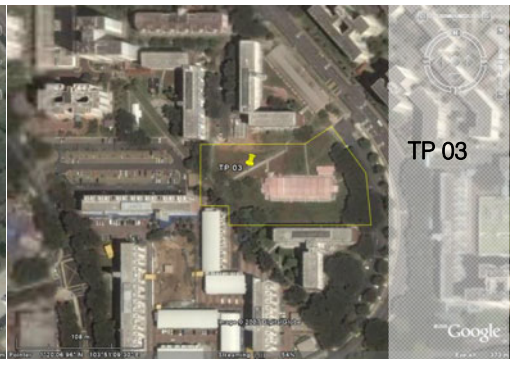
TM 09





TP 02

TM 10



TP 03

TP 04

WL 03

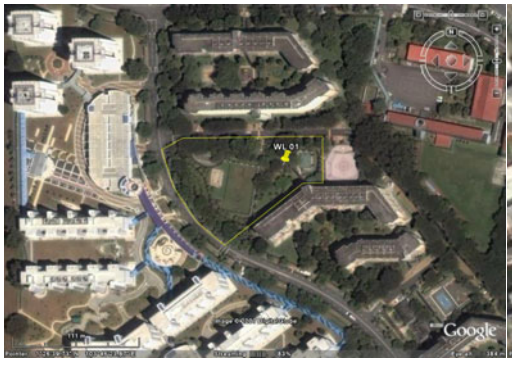
TP 05

WL 04

TP 06

WL 05

WL 01

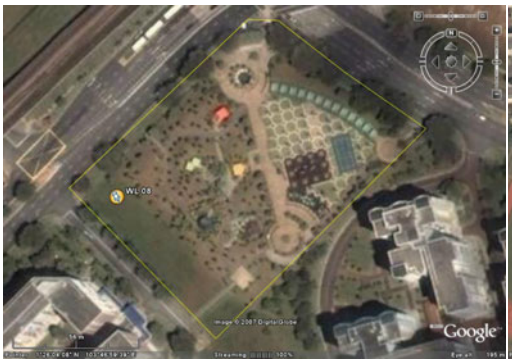


WL 06

WL 02

WL 07

WL 08



YS 01

YS 02

YS 03

YS 04

APPENDIX B: SURVEY QUESTIONNAIRE (ENGLISH VERSION)

A RESIDENTIAL SURVEY ON
- Design
- Use
- Meaning
OF HDB NEIGHBORHOOD PARK

Questionnaire No:

HDB New Town: _____

Address: Block _____ Floor____ Unit____

Date: _____(dd) _____(mm) 2007 (yyyy)

Interviewer: _____

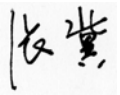
Dear HDB residents,

The open spaces within the urban environment are unique and important resources. In order to create for people a better living environment, planners and designers need to know people's opinions toward the design, use and management of these open spaces. This is where your responses are invaluable.

I am conducting a survey on how HDB residents use and experience the nearby neighborhood parks and other open spaces, and how residents perceive and feel about them. This survey is part of my PhD research work which is funded by NUS. The results of this study will have important implications to HDB planners, landscape designers, open space managers, and those who are concerned about the future of your neighborhood environment.

The student come to your door is an assistant of our research project, and he/she will guide you on how to answer the questionnaire. I hope you will participate in this survey. Thank you very much for your kind cooperation!

Sincerely,



Zhang Ji
Department of Architecture
School of Design and Environment
National University of Singapore (NUS)

Declaration: To respect your privacy, all responses will be kept anonymous. The information will be used for academic research and publications only. No personal details relating to any individual will be divulged in these publications.

If you have any question or want to know more about this project please contact me by 91911252 or by email: hdbparksurvey2007@gmail.com or zhang.ji@nus.edu.sg

■ **Please rate each photo according to *How much you like the landscape.***

	☹ ☹ ☹ **Don't like it at all**	☹ ☹	☹	😐 **Moderately**	☺	☺ ☺	☺ ☺ ☺ **Like it very much**
Photo No. 1	1	2	3	4	5	6	7
Photo No. 2	1	2	3	4	5	6	7
Photo No. 3	1	2	3	4	5	6	7
Photo No. 4	1	2	3	4	5	6	7
Photo No. 5	1	2	3	4	5	6	7
Photo No. 6	1	2	3	4	5	6	7
Photo No. 7	1	2	3	4	5	6	7
Photo No. 8	1	2	3	4	5	6	7
Photo No. 9	1	2	3	4	5	6	7
Photo No. 10	1	2	3	4	5	6	7
Photo No. 11	1	2	3	4	5	6	7
Photo No. 12	1	2	3	4	5	6	7
Photo No. 13	1	2	3	4	5	6	7
Photo No. 14	1	2	3	4	5	6	7
Photo No. 15	1	2	3	4	5	6	7
Photo No. 16	1	2	3	4	5	6	7
Photo No. 17	1	2	3	4	5	6	7
Photo No. 18	1	2	3	4	5	6	7
Photo No. 19	1	2	3	4	5	6	7
Photo No. 20	1	2	3	4	5	6	7
Photo No. 21	1	2	3	4	5	6	7
Photo No. 22	1	2	3	4	5	6	7
Photo No. 23	1	2	3	4	5	6	7
Photo No. 24	1	2	3	4	5	6	7
Photo No. 25	1	2	3	4	5	6	7
Photo No. 26	1	2	3	4	5	6	7
Photo No. 27	1	2	3	4	5	6	7
Photo No. 28	1	2	3	4	5	6	7
Photo No. 29	1	2	3	4	5	6	7
Photo No. 30	1	2	3	4	5	6	7

1) How often do you do the following activities in your neighborhood park *alone* or *with your family*?

		Seldom (once a year or less)	Occasionally (every other month or less)	Sometimes (once a month or more)	Quite often (once a week or more)	Frequently (almost everyday)
1.1	Jogging	1	2	3	4	5
1.2	Playing football or basketball	1	2	3	4	5
1.3	Exercise at the fitness corner	1	2	3	4	5
1.4	Bicycling	1	2	3	4	5
1.5	Playing with my children	1	2	3	4	5
1.6	Walking with my family members	1	2	3	4	5
1.7	Strolling around	1	2	3	4	5
1.8	Sitting or reading on the bench	1	2	3	4	5
1.9	Taking a rest inside the pavilion	1	2	3	4	5
1.10	Observing birds, squirrels, or other wildlife	1	2	3	4	5
1.11	Enjoying the greenery and fresh air	1	2	3	4	5
1.12	Walking my pet	1	2	3	4	5
1.13	Watching people around there	1	2	3	4	5
1.14	Others (please specify):	1	2	3	4	5

2) How often do you do the following activities in your neighborhood park *with your friends or neighbors*?

		Seldom (once a year or less)	Occasionally (every other month or less)	Sometimes (once a month or more)	Quite often (once a week or more)	Frequently (almost everyday)
2.1	Meeting friends to go to other places	1	2	3	4	5
2.2	Exercising (e.g. jogging, body-building)	1	2	3	4	5
2.3	Chatting	1	2	3	4	5
2.4	Walking around the park	1	2	3	4	5
2.5	Playing football/basketball/tennis/badminton	1	2	3	4	5
2.6	Taking a rest on the bench or inside the pavilion	1	2	3	4	5
2.7	Exploring nature in the park	1	2	3	4	5
2.8	Playing cards or board games	1	2	3	4	5
2.9	Joining in barbeque party	1	2	3	4	5
2.10	Joining in community activities (e.g. traditional festival party, community party, musical performance)	1	2	3	4	5
2.11	Discussing or sharing what I know about the plants and wildlife in the park	1	2	3	4	5
2.12	Others (please specify):	1	2	3	4	5

3) What are your *feelings* to the nearby *neighborhood park*?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.1	I feel this park is a part of me.	1	2	3	4	5
3.2	This park is the best place for what I like to do.	1	2	3	4	5
3.3	I would like to know the history of this park.	1	2	3	4	5
3.4	This park is very special to me.	1	2	3	4	5
3.5	To me, no other places can compare to this nearby neighborhood park.	1	2	3	4	5
3.6	I always pay particular attentions to the changes happening to this park.	1	2	3	4	5
3.7	I feel I am deeply connected with this park emotionally	1	2	3	4	5
3.8	I get more satisfaction out of visiting this park than from visiting any other parks.	1	2	3	4	5
3.9	It is important for me to know how this park may be redesigned and redeveloped by the authority in future.	1	2	3	4	5
3.10	Visiting and using this park says a lot about who I am.	1	2	3	4	5
3.11	Doing what I do in this park is more important to me than doing it in any other place.	1	2	3	4	5
3.12	I care about the neighborhood park very much.	1	2	3	4	5
3.13	This neighborhood park means a lot to me.	1	2	3	4	5
3.14	I will not find any other places to do the types of things I usually do in this neighborhood park.	1	2	3	4	5
3.15	I would be very willing to invest my time and energy on activities related to this park.	1	2	3	4	5
3.16	Others (please specify) :	1	2	3	4	5

4) Why do you to visit your neighborhood park?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.1	I can meet friends and neighbors in this park	1	2	3	4	5
4.2	I can relax and feel totally refreshed in this park	1	2	3	4	5
4.3	It's a good place for me to exercise	1	2	3	4	5
4.4	The landscapes of the park make me feel close to nature	1	2	3	4	5
4.5	I can get away from the stress of the chaotic urban life	1	2	3	4	5
4.6	I can find peace and places for privacy in the park	1	2	3	4	5
4.7	I enjoy being with my family members in the park	1	2	3	4	5
4.8	The park is like an extension of my home when my house is crowded	1	2	3	4	5
4.9	I can calm down and forget my worries	1	2	3	4	5
4.10	I just pass by or get across the park on my way to other places	1	2	3	4	5
4.11	Others (please specify):	1	2	3	4	5

5) What kind of place do you think your neighborhood park is, *BASICALLY*?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.1	It is *a place of recreation*	1	2	3	4	5
5.2	It is *a platform of my community life*	1	2	3	4	5
5.3	It is *a quiet and peaceful place to stay alone*	1	2	3	4	5
5.4	It is *a representation of 'the Garden City of Singapore'*	1	2	3	4	5
5.5	It is *a socializing place*	1	2	3	4	5
5.6	It is *a part of the city's overall green open space network*	1	2	3	4	5
5.7	It is *a place that has been forgotten by residents*	1	2	3	4	5
5.8	It is *an urban forest*	1	2	3	4	5
5.9	It is *a representation of the neighborhood I live in*	1	2	3	4	5
5.10	It is *a part of the natural eco-system of the earth*	1	2	3	4	5
5.11	It is *a place that nobody would like to go*	1	2	3	4	5
5.12	Others (please specify):	1	2	3	4	5

6) In comparison with other parks, do you think each of the following design elements in your neighborhood park is *UNIQUE* or not?

		Not at all	Slightly	Moderately	Very much	Extremely
6.1	Landform (terrain or topography of the park)	1	2	3	4	5
6.2	The way the vegetation are organized and planted	1	2	3	4	5
6.3	Birds, squirrels, and other wildlife living in the park	1	2	3	4	5
6.4	Various plant species	1	2	3	4	5
6.5	Children's playground	1	2	3	4	5
6.6	The way the paths and jogging trails are laid out	1	2	3	4	5
6.7	Sports fields (e.g. basketball court, tennis court)	1	2	3	4	5
6.8	Fitness corner	1	2	3	4	5
6.9	Lawn and flowerbed	1	2	3	4	5
6.10	Outdoor stage or platform	1	2	3	4	5
6.11	Tables and benches	1	2	3	4	5
6.12	Buildings, pavilions, tents, and pergolas	1	2	3	4	5
6.13	Barbeque field	1	2	3	4	5
6.14	Lighting features	1	2	3	4	5
6.15	Covered walkway	1	2	3	4	5
6.16	Dry stream, pool, and bridges (if there is one)	1	2	3	4	5
6.17	Pattern of the ground pavement	1	2	3	4	5
6.18	Others (please specify):	1	2	3	4	5

7) How will you evaluate the *quality* of your neighborhood park in following aspects?

7.1	The park is very noisy	1	2	3	4	5	The park is very quiet
7.2	The park is very dirty	1	2	3	4	5	The park is very clean
7.3	The park is very difficult to access	1	2	3	4	5	The park can be accessed easily
7.4	The park looks dangerous to me	1	2	3	4	5	I feel very safe in the park
7.5	There's nothing I can do in the park	1	2	3	4	5	I can do a lot of things in the park
7.6	The park looks boring	1	2	3	4	5	The park is extremely scenic
7.7	I always lose my way in the park	1	2	3	4	5	I can find my way easily in the park
7.8	I feel uncomfortable in the park	1	2	3	4	5	I feel very comfortable in the park
7.9	It is very hot in the park	1	2	3	4	5	It is very cool in the park
7.10	The park is very crowded	1	2	3	4	5	The park is not crowded at all
7.11	I feel tense in the park	1	2	3	4	5	I feel extremely relaxed in the park
7.12	The park is too small	1	2	3	4	5	The park is spacious
7.13	The park is too artificial	1	2	3	4	5	The park is very natural
7.14	The park is isolated from other spaces	1	2	3	4	5	It is well connected with other spaces
7.15	The park is not pleasant at all	1	2	3	4	5	The park is very pleasant
7.16	There're few species of wildlife and plants there	1	2	3	4	5	There're many species of wildlife and plants in the park
7.17	The park is overgrown with grass, shrubs, and tree branches	1	2	3	4	5	The lawn, the flowerbeds, and the trees are neatly trimmed
7.18	The recreational facilities in the park are old and scant	1	2	3	4	5	The abundant facilities in the park are in good condition

7.19	Generally speaking, I think the quality of this neighborhood park is:	Very poor	Not good	Good	Very good	Excellent
		1	2	3	4	5

8) If your neighborhood park is going to *be upgraded*, will you agree with the following proposals?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.1	Create more **sports fields** (e.g. tennis court, basketball court)	1	2	3	4	5
8.2	Create more **trails** for jogging	1	2	3	4	5
8.3	Create more places for **barbeque** or **picnic**	1	2	3	4	5
8.4	Upgrade the facilities of **children's playground**	1	2	3	4	5
8.5	Remove trees and shrubs to create **lawns** for football	1	2	3	4	5
8.6	Build more **fitness corners**	1	2	3	4	5
8.7	Build **small shops** of everyday groceries there	1	2	3	4	5
8.8	Build interesting **landmark for the entrance**	1	2	3	4	5
8.9	Build **coffee shop** there	1	2	3	4	5
8.10	Add more **architectural shelters** (e.g. pavilions, tents, pergola)	1	2	3	4	5
8.11	Extend the **covered walkways**	1	2	3	4	5
8.12	Create quiet **reading places**	1	2	3	4	5
8.13	Plant more **shady trees**	1	2	3	4	5
8.14	Plant the trees **in an orderly manner** along the path	1	2	3	4	5
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8.15	Add more **lighting features** along the path	1	2	3	4	5
8.16	Enforce **strict regulations** on litter and vandalism	1	2	3	4	5
8.17	Arrange shrubs and flowerbeds **in geometric patterns**	1	2	3	4	5
8.18	**Cut overgrown plants** to allow people to see through the woods	1	2	3	4	5
8.19	Add more **tables and benches** for rest	1	2	3	4	5
8.20	**Trim lawns and shrubs** along the paths regularly	1	2	3	4	5
8.21	Replant the empty park land with **dense vegetation for wildlife** to live in	1	2	3	4	5
8.22	Plant trees, shrubs, or flowerbeds **in natural ways** as in the forest	1	2	3	4	5
8.23	Grow more **flower trees and shrubs**	1	2	3	4	5
8.24	**Let plants grow naturally** to create an organic or natural landscape	1	2	3	4	5
8.25	Create **water features** (e.g. fountains, pools, ponds, water cascade, artificial dry streams)	1	2	3	4	5
8.26	Introduce **more species of plants**	1	2	3	4	5
8.27	Create **undulating natural terrains** like a rolling hill	1	2	3	4	5
8.28	Introduce more **tropical plants** (e.g. coconut trees, palms, banyan trees)	1	2	3	4	5
8.29	Create **art corners** for youth and artists to show art works (e.g. mosaics, statues)	1	2	3	4	5
8.30	Create **adventure playground** for roller-skating or scooter	1	2	3	4	5
8.31	Create statues, paintings, or other **art works representing cultures of different races**	1	2	3	4	5
8.32	Build **outdoor theatre or stage** for performance and play	1	2	3	4	5
8.33	Add **sign boards** to explain the names of plants or wildlife habitat in the park	1	2	3	4	5
8.34	Build **multipurpose building** for people to use for various activities in raining days	1	2	3	4	5
8.35	Increase the **size** of the park	1	2	3	4	5
8.36	Others (please specify):	1	2	3	4	5

9) If there are *unsatisfactory* or *unacceptable* changes to your neighborhood park, how will you respond to these hypothetical negative changes?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.1	I will not visit the park any more	1	2	3	4	5
9.2	I may feel some kind of personal loss	1	2	3	4	5
9.3	I will attend community meetings to protest the changes	1	2	3	4	5
9.4	I may feel very sad	1	2	3	4	5
9.5	I may join community activities to fight the changes	1	2	3	4	5
9.6	I may try to find other parks nearby to satisfy my recreation needs	1	2	3	4	5
9.7	I may feel it is a reduction in the quality of my life	1	2	3	4	5

9.8	I will urge the residents committee to take action to stop the changes	1	2	3	4	5
9.9	I may miss many previous characteristics of the park	1	2	3	4	5
9.10	I will complain to the Town Council about the changes	1	2	3	4	5
9.11	Others (please specify):	1	2	3	4	5

10) Are you willing to participate in the following *park-related community activities*?

		Not at all	Slight	Moderately	Very	Extremely
10.1	Would you like to **attend public meetings** to work with HDB landscape designers and express your own opinions on how the neighborhood park should be designed?	1	2	3	4	5
10.2	Are you willing to **share part of the fee of park improvements** that are based on your suggestions of neighborhood park upgrading, if they are accepted by HDB?	1	2	3	4	5
10.3	Would you like to **join the park committee** and **work with park staffs** to take care of your own neighborhood park, if residents are involved in park management?	1	2	3	4	5
10.4	Would you like to **work in the community gardens** on a plot to grow your own flowers or vegetables within the neighborhood park, if there is one?	1	2	3	4	5

11) What are your feelings toward the *neighborhood* in which you live now?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11.1	I am proud to be a resident of this neighborhood	1	2	3	4	5
11.2	I will feel sorry if I move out this neighborhood	1	2	3	4	5
11.3	This neighborhood is like a big family to me	1	2	3	4	5
11.4	To live in this neighborhood means a lot to me	1	2	3	4	5
11.5	I feel I am deeply connected to this neighborhood	1	2	3	4	5
11.6	I feel comfortable living in this neighborhood	1	2	3	4	5
11.7	My neighbors are all kind and helpful	1	2	3	4	5
11.8	I feel that I am definitely a part of this neighborhood	1	2	3	4	5
11.9	This neighborhood can satisfy most of my needs	1	2	3	4	5
11.10	Others (please specify):	1	2	3	4	5

12) Are the following places and design items helpful for you in *recognizing* your own neighborhood?

		Not helpful at all	A bit helpful	Helpful	Quite helpful	Very helpful
12.1	MRT/LRT station or bus stop	1	2	3	4	5
12.2	Shopping mall at town centre	1	2	3	4	5
12.3	Community centre	1	2	3	4	5

12.4	Neighborhood park	1	2	3	4	5
12.5	Children's playground downstairs	1	2	3	4	5
12.6	Architectural design of the blocks	1	2	3	4	5
12.7	Block number sign	1	2	3	4	5
12.8	Landscaped sign of neighborhood entrance	1	2	3	4	5
12.9	Others (Please specify):	1	2	3	4	5

13) How often do you visit the following open spaces?

		Seldom (once a year or less)	**Occasionally** (every other month or less)	**Sometimes** (once a month or more)	**Quite often** (once a week or more)	**Frequently** (almost everyday)
13.1	武吉知马自然保护区 Bukit Timah Nature Reserve	1	2	3	4	5
13.2	新加坡植物园 Botanic Garden	1	2	3	4	5
13.3	白沙公园 Pasir Ris Park	1	2	3	4	5
13.4	附近的邻里公园 Nearby neighborhood park	1	2	3	4	5
13.5	福康宁公园 Fort Canning Park	1	2	3	4	5
13.6	加冷河畔公园 Kallang Riverside Park	1	2	3	4	5
13.7	双溪布洛湿地保护区 Sungei Buloh Wetland Reserve	1	2	3	4	5
13.8	裕廊飞禽公园 Jurong Bird Park	1	2	3	4	5
13.9	东海岸公园 East Coast Park	1	2	3	4	5
13.10	楼下的邻里游戏场地 Precinct playground downstairs	1	2	3	4	5
13.11	花柏山公园 Mount Faber Park	1	2	3	4	5
13.12	滨海艺术中心公园 Esplanade Park	1	2	3	4	5
13.13	中央蓄水池自然保护区 Central Catchment Nature Reserve	1	2	3	4	5
13.14	裕华园 Chinese Garden	1	2	3	4	5
13.15	西海岸公园 West Coast Park	1	2	3	4	5

13.16	楼下的组屋底层空间 Void deck area downstairs	1	2	3	4	5
13.17	武吉巴督自然公园 Bukit Batok Nature Park	1	2	3	4	5
13.18	滨海湾公园 Marina Promenade	1	2	3	4	5
13.19	乌敏岛 Pulau Ubin	1	2	3	4	5
13.20	圣淘沙岛 Sentosa Island	1	2	3	4	5
13.21	Others (Please specify):	1	2	3	4	5

14) How often do you meet with your *neighbors* or *friends* at the following places within your town?

		Never	Seldom	Sometimes	Quite often	Very frequently
14.1	Shopping mall at town centre	1	2	3	4	5
14.2	MRT station	1	2	3	4	5
14.3	Community centre	1	2	3	4	5
14.4	Hawker centre	1	2	3	4	5
14.5	Neighborhood park near my home	1	2	3	4	5
14.6	Precinct playground downstairs	1	2	3	4	5
14.7	Corridor outside my flat	1	2	3	4	5
14.8	Void deck downstairs	1	2	3	4	5
14.9	Covered walkway to the bus stop	1	2	3	4	5
14.10	Others (please specify):	1	2	3	4	5

15) What are the reasons for you to choose to live in your present HDB flat?

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
15.1	Cost of living	1	2	3	4	5
15.2	Recreation facilities	1	2	3	4	5
15.3	Layout of the flat	1	2	3	4	5
15.4	Safety of public spaces	1	2	3	4	5
15.5	Architectural design of the buildings	1	2	3	4	5
15.6	Parks and other landscaped open spaces	1	2	3	4	5
15.7	Nearby school for children	1	2	3	4	5
15.8	Transportation	1	2	3	4	5
15.9	Others (please specify):	1	2	3	4	5

16) About Yourself:

16.1 Age: 1) 15-19 2) 20-29 3) 30-39 4) 40-49 5) 50-59 6) 60 and older

16.2 Gender: 1) Male 2) Female

16.3 Ethnicity: 1) Chinese 2) Malay 3) Indian 4) Others (please specify) _____

16.4 Religion:

1) Buddhist 2) Taoist 3) Muslim

4) Christian 5) Catholic 6) Hindu 7) Others (please specify) _____

16.5 Highest Level of Education:

1) PSLE and below 2) O/N levels 3) A levels

4) ITE certificate 5) Poly Diploma 6) Graduate degree and above

16.6 Years living in the present HDB flat:

1) Less than a year 2) 1 - 3 years 3) 3 - 6 years 4) 6 - 9 years 5) 9 years or longer

16.7 Flat Type:

1) 1-2 room 2) 3 room 3) 4 room 4) 5 room 5) HDB Executive Suit

16.8 Type of Family:

1) Young couple with no children yet 2) With children aged 6 and below 3) With schooling children

4) With working children 5) Three-generation family 6) Elderly couple living on own

7) Others (please specify) _____

16.9 Do you own or rent this HDB flat? 1) Own 2) Rent

17) How much knowledge/experience do you have with respect to the following aspects?

		Not at all	Slightly	Moderately	Very much	Extremely
17.1	I can identify many different plant species in nature	1	2	3	4	5
17.2	I can tell the names of many animals I see in nature	1	2	3	4	5
17.3	I can tell where some of the wildlife live in nature	1	2	3	4	5
17.4	I know the natural history of Singapore	1	2	3	4	5
17.5	I'm aware of the global ecological problems nowadays	1	2	3	4	5
17.6	Others (please specify):	1	2	3	4	5

18) How often do you do the following nature related activities?

		Never	Seldom	Sometimes	Quite often	Very frequently
18.1	Watch TV programs about the natural world	1	2	3	4	5
18.2	Read about books on nature	1	2	3	4	5
18.3	Search the internet for information about nature	1	2	3	4	5
18.4	Join friends in nature observation activities	1	2	3	4	5
18.5	Volunteer in community gardening activities	1	2	3	4	5
18.6	Others (please specify):	1	2	3	4	5

THANK YOU VERY MUCH FOR YOUR KIND COOPERATION!!!

APPENDIX C: SURVEY QUESTIONNAIRE (CHINESE VERSION)

组屋区邻里公园的
– *设计*
– *使用*
– *意义*
居民问卷调查研究

问卷编号：

HDB 新镇：_____

地址：大牌_____ 楼层_____ 单元_____

日期：_____（日）_____（月）2007（年）

问卷记录人：_____

尊敬的组屋居民，您好！

城市中的开放空间是非常独特和重要的资源。为了给人们创造更好的居住环境，规划师和设计师需要了解人们对这些空间的设计、使用以及管理有什么样的意见。因此您的回应有非常重要的意义。

这个问卷调查将要了解组屋居民是如何使用和体验附近的邻里公园，居民是如何感知这些公园，以及居民对这些公园的感想和感受。这个问卷调查是我本人的博士研究课题的一部分，并且得到了新加坡国立大学的资助。这个研究的成果对于建屋局的规划师、环境设计师、开放空间的管理者，以及所有关心您的组屋邻里居住环境的人都将有重要意义。

你见到的这位学生是我们的研究助手，他/她将帮助和指导您如何完成这份问卷。希望您能够参与这个问卷调查。对于您热心的合作我们深表感激！

此谢！

张冀
建筑系（Department of Architecture）
设计与环境学院（School of Design & Environment）
新加坡国立大学（NUS）

声明：为了尊重您的隐私，所有的回答信息都是匿名的。这些信息只会被用于学术研究和发表。与个人相关的任何详细信息都不会在这些发表的文献中透露。

如果您有任何问题需要咨询，或者希望了解更多的与这个研究项目相关的信息，请与我联系：91911252
Email: hdbparksurvey2007@gmail.com or zhang.ji@nus.edu.sg

■ 请根据**<u>您对这些公园景观的喜欢程度</u>**为每张照片打分。

	☹ ☹ ☹ 一点也不喜欢	☹ ☹	☹	😐 普通	☺	☺ ☺	☺ ☺ ☺ 非常喜欢
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相片 24	1	2	3	4	5	6	7
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相片 26	1	2	3	4	5	6	7
相片 27	1	2	3	4	5	6	7
相片 28	1	2	3	4	5	6	7
相片 29	1	2	3	4	5	6	7
相片 30	1	2	3	4	5	6	7

1) 您经常*独自*或*与家人*在附近的邻里公园中进行下面这些活动吗？

		极少（一年去一次或更少）	偶尔（两个月去一次或更少）	有时（一个月去一次或更多）	经常（一周去一次或更多）	非常频繁(几乎每天都去)
1.1	跑步	1	2	3	4	5
1.2	踢足球或打篮球	1	2	3	4	5
1.3	在健身区锻炼	1	2	3	4	5
1.4	骑脚车	1	2	3	4	5
1.5	陪孩子玩耍	1	2	3	4	5
1.6	与我的家人散步	1	2	3	4	5
1.7	独自散步	1	2	3	4	5
1.8	在长凳上独坐或者读书	1	2	3	4	5
1.9	在建筑物或者亭子里面休息	1	2	3	4	5
1.10	观察公园里的小鸟、松鼠和其他小动物	1	2	3	4	5
1.11	欣赏植物绿化、感受新鲜的空气	1	2	3	4	5
1.12	带宠物出来散步	1	2	3	4	5
1.13	观看公园中来来往往的其他人	1	2	3	4	5
1.14	其他（请说明）：	1	2	3	4	5

2) 您经常*与邻居或者朋友*在附近的邻里公园中进行下面这些活动吗？

		极少（一年去一次或更少）	偶尔（两个月去一次或更少）	有时（一个月去一次或更多）	经常（一周去一次或更多）	非常频繁(几乎每天都去)
2.1	与朋友会面，然后去其他地方	1	2	3	4	5
2.2	锻炼身体（例如：跑步，健身）	1	2	3	4	5
2.3	交谈、聊天	1	2	3	4	5
2.4	在公园中散步	1	2	3	4	5
2.5	踢足球、打篮球、或者打网球、羽毛球	1	2	3	4	5
2.6	在长凳上或者在亭子里休息	1	2	3	4	5
2.7	探索了解公园里的自然世界	1	2	3	4	5
2.8	玩纸牌或者下棋	1	2	3	4	5
2.9	参加烧烤聚会	1	2	3	4	5
2.10	参加社区活动（例如：传统节日聚会、社区聚会、音乐演奏会）	1	2	3	4	5
2.11	与别人分享我所知道的有关公园的植物和动物的知识	1	2	3	4	5
2.12	其他（请说明）：	1	2	3	4	5

3) 您对附近的这个*邻里公园*有何感想呢？

		完全不同意	不同意	普通	同意	非常同意
3.1	我感觉这个公园就像是我自己的一个部分	1	2	3	4	5
3.2	对于我喜欢做的事情而言，这个公园是最合适的地方了	1	2	3	4	5
3.3	我非常乐意了解这个公园过去的历史	1	2	3	4	5
3.4	对我来说，这个公园是一个非常特殊的地方	1	2	3	4	5
3.5	对我来说，其他地方都比不上我家附近的这个邻里公园	1	2	3	4	5
3.6	我总是非常关注这个公园正在发生的变化	1	2	3	4	5
3.7	我觉得自己在情感上与这个公园是紧密联系在一起的	1	2	3	4	5
3.8	与其他公园相比,使用这个公园会让我觉得更加满意	1	2	3	4	5
3.9	了解当局今后会如何重新设计和发展这个公园,这对我来说非常重要	1	2	3	4	5
3.10	访问和使用这个公园能在很多方面说明我自己是怎样的一个人	1	2	3	4	5
3.11	在这个公园而不是在其他公园里做我想做的事情,这对于我来说非常重要	1	2	3	4	5
3.12	我非常关心这个公园	1	2	3	4	5
3.13	这个邻里公园对于我个人有非常重要的意义	1	2	3	4	5
3.14	我认为,找不到别的地方来做我经常在这个公园里进行的活动了	1	2	3	4	5
3.15	我会非常乐意付出自己的时间和精力参加和这个公园有关的活动	1	2	3	4	5
3.16	其他（请说明）：	1	2	3	4	5

4) 您为什么会使用这个邻里公园呢？

		完全不同意	不同意	普通	同意	非常同意
4.1	我可以在公园中和朋友和邻居会面	1	2	3	4	5
4.2	我可以在这个公园里放松自己，并且恢复旺盛的精力	1	2	3	4	5
4.3	这个公园是一个锻炼身体的好地方	1	2	3	4	5
4.4	这个公园的景观环境让我感觉与自然界非常接近	1	2	3	4	5
4.5	在这个公园里我可以减轻烦乱的城市生活带来的压力	1	2	3	4	5
4.6	我可以在这个公园中找到安宁和独处的空间	1	2	3	4	5
4.7	我很喜欢与家人在这个公园中相处的时间	1	2	3	4	5
4.8	当家里过分拥挤的时候，这个公园就像我家空间的延伸和扩展	1	2	3	4	5
4.9	在这个公园里，我可以冷静下来并且忘掉我的烦恼	1	2	3	4	5
4.10	我只不过在去其他地方的路上才经过或者穿过这个公园	1	2	3	4	5
4.11	其他（请说明）：	1	2	3	4	5

5) 您认为您的邻里公园*基本上*是一个什么样的场所呢？

		完全不同意	不同意	普通	同意	非常同意
5.1	这个邻里公园是：一个进行休闲活动的场所	1	2	3	4	5
5.2	这个邻里公园是：我社区生活的舞台	1	2	3	4	5
5.3	这个邻里公园是：一个幽静安宁、可以独处的场所	1	2	3	4	5
5.4	这个邻里公园是："花园城市新加坡"形象的体现	1	2	3	4	5
5.5	这个邻里公园是：一个社会交往的场所	1	2	3	4	5
5.6	这个邻里公园是：整个城市的绿化开放空间的一部分	1	2	3	4	5
5.7	这个邻里公园是：一个被居民遗忘的地方	1	2	3	4	5
5.8	这个邻里公园是：一片城市中的森林	1	2	3	4	5
5.9	这个邻里公园是：我居住的整个邻里社区的体现	1	2	3	4	5
5.10	这个邻里公园是：整个地球自然生态系统的一部分	1	2	3	4	5
5.11	这个邻里公园是：一个没有人愿意去的地方	1	2	3	4	5
5.12	其他（请说明）：	1	2	3	4	5

6) 与其他公园相比较，您认为在您附近的这个邻里公园中，下面的这些设计元素是不是*十分独特*呢？

		一点也不独特	比较独特	中等	很独特	非常独特
6.1	公园的地形	1	2	3	4	5
6.2	植物种植的方式	1	2	3	4	5
6.3	公园中的小鸟、松鼠和其他小动物	1	2	3	4	5
6.4	众多的植物种类	1	2	3	4	5
6.5	儿童游戏场地	1	2	3	4	5
6.6	公园中的道路和跑步小路的布置方式	1	2	3	4	5
6.7	体育运动场地（例如：篮球场、网球场）	1	2	3	4	5
6.8	健身场地	1	2	3	4	5
6.9	草地和花坛	1	2	3	4	5
6.10	室外的舞台或者平台	1	2	3	4	5
6.11	公园中的桌子和凳子	1	2	3	4	5
6.12	建筑物、亭子、帐篷、花架和绿廊	1	2	3	4	5
6.13	烧烤场地	1	2	3	4	5
6.14	灯光设施	1	2	3	4	5
6.15	公园中的有盖顶的走廊	1	2	3	4	5
6.16	公园中的小溪、水池和小桥（如果有的话）	1	2	3	4	5
6.17	地面的砖和石块拼成的图案	1	2	3	4	5
6.18	其他（请说明）：	1	2	3	4	5

7) 您认为这个邻里公园在下面这些方面的环境质量如何呢？

7.1	这个公园十分吵闹	1	2	3	4	5	这个公园非常安静
7.2	这个公园非常肮脏	1	2	3	4	5	这个公园非常清洁
7.3	公众很难到达这个公园	1	2	3	4	5	我可以非常方便地到达这个公园
7.4	这个公园对我来说很危险	1	2	3	4	5	我觉得在这个公园非常安全
7.5	在这个公园里我没有什么活动可以做	1	2	3	4	5	我可以在这个公园里做很多活动
7.6	这个公园的景色很乏味	1	2	3	4	5	这个公园的景色非常美
7.7	我经常在这个公园里迷路	1	2	3	4	5	在这个公园里辨别方向很容易
7.8	我觉得这个公园的环境很不舒适	1	2	3	4	5	我觉得这个公园的环境非常舒适
7.9	这个公园非常炎热	1	2	3	4	5	这个公园非常凉爽
7.10	这个公园总是挤满了人	1	2	3	4	5	这个公园一点也不拥挤
7.11	在这个公园里我总是觉得很紧张	1	2	3	4	5	在这个公园里我会觉得非常放松
7.12	这个公园太小了	1	2	3	4	5	这个公园的空间很宽阔
7.13	这个公园的景观环过分地人工化了	1	2	3	4	5	这个公园的景观环境非常的自然
7.14	这个公园与其它地方是隔离的	1	2	3	4	5	这个公园跟其它地方联系得很紧密
7.15	这个公园一点也不让人感觉愉快	1	2	3	4	5	这个公园令人感觉非常愉快
7.16	这个公园里动物和植物的种类都非常少	1	2	3	4	5	这个公园里有很多种类的动物和植物
7.17	这个公园到处都是没有修剪的杂草，灌木丛和树枝	1	2	3	4	5	这个公园的花草和树木都修剪得很整齐
7.18	这个公园的休闲设施又少又陈旧	1	2	3	4	5	这个公园里的休闲设施很丰富，维护得很好

7.19	总的来说，	非常差	不怎么好	好	很好	非常的好
	我认为这个邻里公园的环境质量是：	1	2	3	4	5

8) 如果您的邻里公园将要翻新，您会同意下面的这些建议吗？

		完全不同意	不同意	普通	同意	非常同意
8.1	增加更多的**运动场地**（例如网球场、篮球场）	1	2	3	4	5
8.2	增加更多的**用于跑步的小路**	1	2	3	4	5
8.3	增加更多的可用于**烧烤**和**野餐**的场地	1	2	3	4	5
8.4	翻新**儿童游戏场地**的设备	1	2	3	4	5
8.5	将树木移走，修建**平坦开阔的草地**，以供踢球	1	2	3	4	5
8.6	修建更多的用于**健身的场地**	1	2	3	4	5
8.7	在公园旁边修建**售卖日用品的小商店**	1	2	3	4	5
8.8	修建更多**有趣味的地标**	1	2	3	4	5
8.9	在公园旁边修建**咖啡茶座**	1	2	3	4	5
8.10	增加**用于休闲的建筑物**（例如小亭子、帐篷、花架凉棚）	1	2	3	4	5
8.11	加长**有盖顶的步行道**	1	2	3	4	5
8.12	修建安静的、可以**阅读的场地**	1	2	3	4	5
8.13	种植更多的有**浓密树荫的树木**	1	2	3	4	5
8.14	沿着小路**有规律地种植树木**	1	2	3	4	5

		完全不同意	不同意	普通	同意	非常同意
8.15	增加更多的**路灯**	1	2	3	4	5
8.16	实行更为**严格的管理条例**，防止乱丢杂物和破坏公物	1	2	3	4	5
8.17	把灌木丛和花坛排列成**几何图形**	1	2	3	4	5
8.18	**定期修剪**树枝和灌木丛，从而让人们的视线可以穿过	1	2	3	4	5
8.19	增加更多的用于休息的**桌子**和**长凳**	1	2	3	4	5
8.20	**定期修剪**小路边的草地和灌木丛	1	2	3	4	5
8.21	将公园中的空地种上**密集的植物**，好让野生动物在其中生活	1	2	3	4	5
8.22	像森林一样，以**自然的方式**来种植公园的树木、灌木和花丛	1	2	3	4	5
8.23	种植更多的可以**开花的树木和灌木**	1	2	3	4	5
8.24	让公园里的植物**自然地生长**，来创造一种有机和自然的景观	1	2	3	4	5
8.25	增加**水景**（例如喷泉、水池、瀑布叠水，人造小溪）	1	2	3	4	5
8.26	增加公园中**植物的种类**	1	2	3	4	5
8.27	将公园的地形修整得**像山地一样自然起伏**	1	2	3	4	5
8.28	种植更多的**热带植物**（例如椰子树、棕榈树、榕树）	1	2	3	4	5
8.29	增加可以让年轻人和其他艺术家**展示艺术作品的场地**	1	2	3	4	5
8.30	增加可以用于滑旱冰(skating)和玩踏板车(scooter)的**游戏场地**	1	2	3	4	5
8.31	增加可以代表不同种族文化特色的雕塑、壁画或其它**艺术作品**	1	2	3	4	5
8.32	修建可以用于集会、演奏和表演的**室外舞台**	1	2	3	4	5
8.33	增加**布告板**，说明公园中动物居住的地方和各种植物的名称	1	2	3	4	5
8.34	修建可以让居民在雨天进行活动的**多功能建筑**	1	2	3	4	5
8.35	扩大公园的**面积**	1	2	3	4	5
8.36	其他（请说明）：	1	2	3	4	5

9) 如果这个邻里公园发生了*令人不满意的*或者*令人无法接受的*变化，对此您会如何回应呢？

		完全不同意	不同意	普通	同意	非常同意
9.1	我将不会再使用这个公园	1	2	3	4	5
9.2	我会觉得这就像是我个人的一种损失	1	2	3	4	5
9.3	我会参加社区会议反对这些变化	1	2	3	4	5
9.4	我会觉得非常难过	1	2	3	4	5
9.5	我会参加社区活动来抵制这些变化	1	2	3	4	5
9.6	我会寻找其他的公园来满足我的休闲需要	1	2	3	4	5
9.7	我觉得这些变化会降低我的生活质量	1	2	3	4	5
9.8	我会催促居民委员会采取行动来制止这些变化	1	2	3	4	5
9.9	我会想念这个公园过去所具有的特色	1	2	3	4	5
9.10	我会向市镇理事会投诉这些变化	1	2	3	4	5
9.11	其他（请说明）：	1	2	3	4	5

10) 您愿意参加下面这些和公园有关的社区活动吗？

		完全不愿意	不太愿意	普通	很愿意	非常愿意
10.1	您愿意**参加公众会议**，并且与建屋局的环境设计师一起工作，表达你自己对于邻里公园应该如何设计的意见吗？	1	2	3	4	5
10.2	如果您对于邻里公园翻新的意见被建屋局接受了，您愿意与其他居民一起**分摊一部分公园翻新改造的费用**吗？	1	2	3	4	5
10.3	如果居民能够参与公园的管理，您愿意**加入公园委员会**，并且**与公园员工一起工作**来照顾您的邻里公园吗？	1	2	3	4	5
10.4	如果在邻里公园中有一块地，您可以在哪里种植自己的花草或者蔬菜，您会乐意与其他居民一起**在社区花园里劳动**吗？	1	2	3	4	5

11) 您对现在所居住的这个*组屋邻里*有何感想呢？

		完全不同意	不同意	普通	同意	非常同意
11.1	作为这个组屋邻里的居民，我觉得非常骄傲	1	2	3	4	5
11.2	如果我要从这个组屋邻里搬走，我会觉得很难过	1	2	3	4	5
11.3	这个组屋邻里对我来说就像一个大家庭	1	2	3	4	5
11.4	居住在这个组屋邻里对我有非常重要的意义	1	2	3	4	5
11.5	我觉得自己跟这个组屋邻里是紧密联系在一起的	1	2	3	4	5
11.6	我觉得居住在这个组屋邻里非常的舒适	1	2	3	4	5
11.7	我的邻居们都非常友善并且乐于帮助	1	2	3	4	5
11.8	我觉得自己就是这个组屋邻里的一部分	1	2	3	4	5
11.9	生活在这个组屋邻里中,我的大多数需要都可以得到满足	1	2	3	4	5
11.10	其他（请说明）：	1	2	3	4	5

12) 您认为下面的这些地方和设计元素能帮助你认出你自己的组屋邻里吗?

		完全没有帮助	有一点帮助	有帮助	很有帮助	非常有帮助
12.1	地铁站或者巴士车站	1	2	3	4	5
12.2	镇中心的购物商场	1	2	3	4	5
12.3	社区中心	1	2	3	4	5
12.4	邻里公园	1	2	3	4	5
12.5	楼下的儿童游戏场地	1	2	3	4	5
12.6	组屋的建筑设计	1	2	3	4	5
12.7	组屋大牌号码	1	2	3	4	5
12.8	邻里入口的标志	1	2	3	4	5
12.9	其他（请说明）：	1	2	3	4	5

13) 您经常使用下面的这些休闲开放空间吗？

		极少 （一年去一次或更少）	偶尔 （两个月去一次或更少）	有时 （一个月去一次或更多）	经常 （一周去一次或更多）	非常频繁 (几乎每天都去)
13.1	武吉知马自然保护区 Bukit Timah Nature Reserve	1	2	3	4	5
13.2	新加坡植物园 Botanic Garden	1	2	3	4	5
13.3	白沙公园 Pasir Ris Park	1	2	3	4	5
13.4	附近的邻里公园 Nearby neighborhood park	1	2	3	4	5
13.5	福康宁公园 Fort Canning Park	1	2	3	4	5
13.6	加冷河畔公园 Kallang Riverside Park	1	2	3	4	5
13.7	双溪布洛湿地保护区 Sungei Buloh Wetland Reserve	1	2	3	4	5
13.8	裕廊飞禽公园 Jurong Bird Park	1	2	3	4	5
13.9	东海岸公园 East Coast Park	1	2	3	4	5
13.10	楼下的邻里游戏场地 Precinct playground downstairs	1	2	3	4	5
13.11	花柏山公园 Mount Faber Park	1	2	3	4	5
13.12	滨海艺术中心公园 Esplanade Park	1	2	3	4	5
13.13	中央蓄水池自然保护区 Central Catchment Nature Reserve	1	2	3	4	5
13.14	裕华园 Chinese Garden	1	2	3	4	5
13.15	西海岸公园 West Coast Park	1	2	3	4	5
13.16	楼下的组屋底层空间 Void deck area downstairs	1	2	3	4	5
13.17	武吉巴督自然公园 Bukit Batok Nature Park	1	2	3	4	5
13.18	滨海湾公园 Marina Promenade	1	2	3	4	5
13.19	乌敏岛 Pulau Ubin	1	2	3	4	5

13.20	圣淘沙岛 Sentosa Island	1	2	3	4	5
13.21	Others (Please specify):	1	2	3	4	5

14) 您经常在下面的这些地方与<u>你的邻居或者朋友</u>会面吗？

		几乎不	很少	有时候	经常	非常频繁
14.1	市镇中心的购物商场	1	2	3	4	5
14.2	地铁站	1	2	3	4	5
14.3	社区中心	1	2	3	4	5
14.4	小贩中心	1	2	3	4	5
14.5	附近的邻里公园	1	2	3	4	5
14.6	楼下的邻里游戏场地	1	2	3	4	5
14.7	我家外面的走廊上	1	2	3	4	5
14.8	楼下的组屋底层空间	1	2	3	4	5
14.9	连到巴士车站的有盖顶的走廊	1	2	3	4	5
14.10	其他（请说明）：	1	2	3	4	5

15) 您选择居住在目前的组屋的原因有哪些呢？

		完全不同意	不同意	普通	同意	非常同意
15.1	生活开销	1	2	3	4	5
15.2	休闲设施	1	2	3	4	5
15.3	组屋单位的设计	1	2	3	4	5
15.4	公共空间的安全	1	2	3	4	5
15.5	组屋的建筑设计	1	2	3	4	5
15.6	公园和其他有景观环境设计的开放空间	1	2	3	4	5
15.7	临近的可以让孩子上学的学校	1	2	3	4	5
15.8	交通的方便	1	2	3	4	5
15.9	其他（请说明）：	1	2	3	4	5

16) 关于您自己：

16.1 年龄： 1) 15-19 岁 2) 20-29 岁 3) 30-39 岁 4) 40-49 岁 5) 50-59 岁 6) 60 岁及以上

16.2 性别： 1) 男 2) 女

16.3 种族: 1) 华族 2) 马来族 3) 印度族 4) 其他（请说明）_____

16.4 宗教信仰:

1) 佛教信众 2) 道教信众 3) 伊斯兰教信众

4) 基督教信众 5) 天主教信众 6) 印度教信众 7) 其他（请说明）_____

16.5 最高教育经历:

1) PSLE and below 小学教育或以下 2) O/N 水准考试（初中） 3) A 水准考试（高中）

4) ITE certificate 技工学校证书 5) Poly Diploma 工艺学校文凭 6) Graduate degree and above 大学学位或更高

16.6 在目前的组屋单位居住的时间：

1) 少于一年 2) 1 - 3 年 3) 3 - 6 年 4) 6 - 9 年 5) 9 年或者更久

16.7 组屋单位种类:

1) 一房或者两房式 2) 三房式 3) 四房式 4) 五房式 5) HDB Executive Suit

16.8 家庭结构：

1) 尚未有孩子的年轻夫妇 2) 家中有六岁或更小的孩子 3) 家中有正在上学的孩子

4) 家中的孩子都已经工作 5) 三代同堂的家庭 6) 独自居住的老年夫妇

7) 其他（请说明）_____

16.9 您拥有还是租用这个组屋单位呢？ 1) 拥有 2) 租用

17) 您认为你在如下这些方面的知识有多少呢?

		一点也不了解	有一点了解	普通	了解很多	十分了解
17.1	我可以辨认出自然界里的很多树木	1	2	3	4	5
17.2	我知道很多我在自然界中见到的动物的名称	1	2	3	4	5
17.3	我知道某些野生动物在自然界中居住的地方	1	2	3	4	5
17.4	我很了解新加坡自然界的历史	1	2	3	4	5
17.5	我很了解目前全球面临的生态环境问题	1	2	3	4	5
17.6	其他（请说明）：	1	2	3	4	5

18) 您经常参加下面这些与自然有关的活动吗？

		从不	很少	有时	经常	非常频繁
18.1	在电视上观看与自然界有关的节目	1	2	3	4	5
18.2	阅读有关自然界的书籍	1	2	3	4	5
18.3	在英特网上搜索与大自然有关的信息	1	2	3	4	5
18.4	与朋友们一起参加观察大自然的活动	1	2	3	4	5
18.5	在社区公园的活动中做义工	1	2	3	4	5
18.6	其他（请说明）：	1	2	3	4	5

非常感谢您热心的合作!!!

APPENDIX D: PHOTO QUESTIONNAIRE

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

1

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

2

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

3

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

4

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

5

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

6

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

7

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

8

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

9

Don't like it at all ☹☹☹ 1	☹☹ 2	☹ 3	😐 Moderately 4	☺ 5	☺☺ 6	☺☺☺ Like it very much 7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

10

Don't like it at all ☹☹☹ 1	☹☹ 2	☹ 3	😐 Moderately 4	☺ 5	☺☺ 6	☺☺☺ Like it very much 7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

11

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

12

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

13

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

14

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

15

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

16

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

17

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

18

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

19

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

20

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

21

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

22

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

23

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

24

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

25

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

26

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

27

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

28

Don't like it at all ☹☹☹	☹☹	☹	😐 Moderately	☺	☺☺	☺☺☺ Like it very much
1	2	3	4	5	6	7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

29

Don't like it at all ☹☹☹ 1	☹☹ 2	☹ 3	😑 Moderately 4	☺ 5	☺☺ 6	☺☺☺ Like it very much 7

Please rate the photo according to **HOW MUCH YOU LIKE THE LANDSCAPE?**

For Bukit Panjang residents

30

Don't like it at all ☹☹☹ 1	☹☹ 2	☹ 3	😑 Moderately 4	☺ 5	☺☺ 6	☺☺☺ Like it very much 7

APPENDIX E: CORRELATION MATRIX – PARK LANDSCAPE PREFERENCE RATINGS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Photo_01	1														
2	Photo_02	.252(**)	1													
3	Photo_03	.240(**)	.245(**)	1												
4	Photo_04	.242(**)	.208(**)	.317(**)	1											
5	Photo_05	.174(**)	.221(**)	.194(**)	.120(*)	1										
6	Photo_06	.158(**)	.150(**)	.302(**)	.234(**)	.303(**)	1									
7	Photo_07	.319(**)	.212(**)	.162(**)	.203(**)	.320(**)	.189(**)	1								
8	Photo_08	.234(**)	.429(**)	.171(**)	.229(**)	.503(**)	.263(**)	.395(**)	1							
9	Photo_09	.282(**)	.162(**)	.434(**)	.442(**)	.121(*)	.341(**)	.206(**)	.255(**)	1						
10	Photo_10	.352(**)	0.101	.256(**)	.191(**)	.355(**)	.445(**)	.350(**)	.310(**)	.351(**)	1					
11	Photo_11	.217(**)	.335(**)	0.055	.119(*)	.448(**)	.249(**)	.387(**)	.635(**)	.172(**)	.441(**)	1				
12	Photo_12	.165(**)	.288(**)	.404(**)	.335(**)	.351(**)	.361(**)	.251(**)	.399(**)	.422(**)	.384(**)	.398(**)	1			
13	Photo_13	.230(**)	.274(**)	.263(**)	.515(**)	.155(**)	.173(**)	.262(**)	.177(**)	.270(**)	.218(**)	.269(**)	.298(**)	1		
14	Photo_14	.261(**)	.184(**)	.255(**)	.108(*)	.471(**)	.256(**)	.323(**)	.501(**)	.126(*)	.413(**)	.493(**)	.327(**)	.250(**)	1	
15	Photo_15	.199(**)	.140(**)	.417(**)	.448(**)	.108(*)	.332(**)	.227(**)	.174(**)	.604(**)	.295(**)	.159(**)	.389(**)	.348(**)	.189(**)	1
16	Photo_16	.268(**)	.134(*)	.278(**)	.586(**)	.117(*)	.251(**)	.295(**)	.190(**)	.381(**)	.318(**)	.162(**)	.262(**)	.437(**)	0.101	.431(**)
17	Photo_17	.167(**)	.273(**)	.187(**)	0.072	.523(**)	.239(**)	.262(**)	.527(**)	.117(*)	.385(**)	.556(**)	.348(**)	.203(**)	.500(**)	.131(*)
18	Photo_18	.125(*)	-0.030	.377(**)	.365(**)	0.063	.213(**)	0.082	0.066	.411(**)	.240(**)	-0.014	.212(**)	.184(**)	0.095	.546(**)
19	Photo_19	.307(**)	.146(**)	.245(**)	.187(**)	.244(**)	.158(**)	.503(**)	.313(**)	.225(**)	.422(**)	.362(**)	.284(**)	.304(**)	.261(**)	.223(**)
20	Photo_20	.169(**)	.334(**)	0.075	-0.024	.443(**)	.134(*)	.304(**)	.492(**)	0.015	.308(**)	.546(**)	.262(**)	.150(**)	.472(**)	0.018
21	Photo_21	.276(**)	.261(**)	.269(**)	.273(**)	.236(**)	.202(**)	.266(**)	.351(**)	.301(**)	.387(**)	.447(**)	.363(**)	.308(**)	.295(**)	.314(**)
22	Photo_22	.320(**)	.134(**)	.220(**)	.292(**)	.257(**)	.312(**)	.363(**)	.275(**)	.306(**)	.504(**)	.321(**)	.282(**)	.194(**)	.288(**)	.340(**)
23	Photo_23	.203(**)	.353(**)	.145(**)	.121(*)	.401(**)	.152(**)	.318(**)	.590(**)	.103(*)	.314(**)	.570(**)	.313(**)	.180(**)	.443(**)	0.072
24	Photo_24	.217(**)	0.057	.370(**)	.365(**)	0.098	.346(**)	.225(**)	.134(**)	.518(**)	.387(**)	0.095	.406(**)	.235(**)	.167(**)	.579(**)
25	Photo_25	.293(**)	0.067	.307(**)	.348(**)	.183(**)	.249(**)	.329(**)	.249(**)	.291(**)	.432(**)	.251(**)	.290(**)	.322(**)	.269(**)	.416(**)
26	Photo_26	.258(**)	.326(**)	0.056	0.066	.365(**)	.170(**)	.342(**)	.522(**)	.109(*)	.364(**)	.568(**)	.298(**)	.237(**)	.485(**)	.135(**)
27	Photo_27	.236(**)	.376(**)	.114(*)	.111(*)	.283(**)	.177(**)	.280(**)	.456(**)	.134(**)	.339(**)	.497(**)	.320(**)	.285(**)	.316(**)	.118(*)
28	Photo_28	.178(**)	.221(**)	.312(**)	.522(**)	0.063	.242(**)	.169(**)	0.065	.297(**)	.220(**)	.151(**)	.214(**)	.537(**)	.131(*)	.399(**)
29	Photo_29	.266(**)	.322(**)	.184(**)	.120(*)	.493(**)	.183(**)	.332(**)	.524(**)	0.075	.439(**)	.521(**)	.298(**)	.190(**)	.524(**)	.108(*)
30	Photo_30	.265(**)	.167(**)	.350(**)	.332(**)	0.045	.284(**)	.134(*)	.195(**)	.435(**)	.292(**)	.215(**)	.322(**)	.264(**)	.180(**)	.593(**)

**. Pearson correlation is significant at the 0.01 level (2-tailed).

*. Pearson correlation is significant at the 0.05 level (2-tailed).

(continued)

		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Photo_01															
2	Photo_02															
3	Photo_03															
4	Photo_04															
5	Photo_05															
6	Photo_06															
7	Photo_07															
8	Photo_08															
9	Photo_09															
10	Photo_10															
11	Photo_11															
12	Photo_12															
13	Photo_13															
14	Photo_14															
15	Photo_15															
16	Photo_16	1														
17	Photo_17	.163(**)	1													
18	Photo_18	.433(**)	.106(*)	1												
19	Photo_19	.353(**)	.326(**)	.174(**)	1											
20	Photo_20	0.056	.493(**)	-0.039	.360(**)	1										
21	Photo_21	.186(**)	.369(**)	.153(**)	.402(**)	.344(**)	1									
22	Photo_22	.373(**)	.320(**)	.300(**)	.440(**)	.230(**)	.332(**)	1								
23	Photo_23	.145(**)	.591(**)	-0.036	.402(**)	.534(**)	.378(**)	.378(**)	1							
24	Photo_24	.398(**)	.123(*)	.559(**)	.264(**)	-0.044	.240(**)	.493(**)	.126(*)	1						
25	Photo_25	.411(**)	.203(**)	.347(**)	.411(**)	.115(*)	.334(**)	.522(**)	.306(**)	.525(**)	1					
26	Photo_26	.183(**)	.467(**)	-0.025	.385(**)	.511(**)	.346(**)	.396(**)	.588(**)	.200(**)	.380(**)	1				
27	Photo_27	.151(**)	.434(**)	-.119(*)	.378(**)	.456(**)	.489(**)	.317(**)	.547(**)	.117(*)	.259(**)	.518(**)	1			
28	Photo_28	.503(**)	.125(*)	.333(**)	.240(**)	0.102	.336(**)	.253(**)	.178(**)	.408(**)	.389(**)	.189(**)	.215(**)	1		
29	Photo_29	.120(*)	.564(**)	0.023	.386(**)	.519(**)	.423(**)	.269(**)	.630(**)	.143(**)	.332(**)	.552(**)	.560(**)	.291(**)	1	
30	Photo_30	.382(**)	.162(**)	.459(**)	.211(**)	0.058	.321(**)	.419(**)	.197(**)	.528(**)	.431(**)	.249(**)	.183(**)	.454(**)	.185(**)	1

**. Pearson correlation is significant at the 0.01 level (2-tailed).

*. Pearson correlation is significant at the 0.05 level (2-tailed).

APPENDIX F: CORRELATION MATRIX - PARK ATTACHMENT MEASUREMENT ITEMS

		I 1	I2	I3	I4	I5	D1	D2	D3	D4	D5	C1	C2	C3	C4	C5
I1	I feel this park is a part of me.	1.00														
I2	This park is very special to me.	0.58	1.00													
I3	I feel I am deeply connected with this park emotionally.	0.54	0.54	1.00												
I4	Visiting and using this park says a lot about who I am.	0.43	0.47	0.47	1.00											
I5	This neighborhood park means a lot to me.	0.53	0.59	0.54	0.48	1.00										
D1	This park is the best place for what I like to do.	0.62	0.53	0.47	0.44	0.45	1.00									
D2	To me, no other places can compare to this nearby neighborhood park.	0.50	0.61	0.46	0.41	0.47	0.52	1.00								
D3	I get more satisfaction out of visiting this park than from visiting any other parks.	0.47	0.58	0.63	0.51	0.53	0.54	0.58	1.00							
D4	Doing what I do in this park is more important to me than doing it in any other place.	0.41	0.43	0.55	0.54	0.48	0.45	0.48	0.57	1.00						
D5	I will not find any other places to do the types of things I usually do in this neighborhood park.	0.27	0.44	0.44	0.39	0.40	0.35	0.49	0.51	0.47	1.00					
C1	I would like to know the history of this park.	0.37	0.39	0.43	0.36	0.32	0.39	0.29	0.40	0.35	0.32	1.00				
C2	I always pay particular attentions to the changes happening to this park.	0.39	0.49	0.50	0.38	0.49	0.37	0.41	0.49	0.42	0.33	0.37	1.00			
C3	It is important for me to know how this park may be redesigned and redeveloped by the authority in future.	0.34	0.30	0.34	0.31	0.39	0.21	0.23	0.30	0.37	0.18	0.33	0.48	1.00		
C4	I care about the neighborhood park very much.	0.57	0.52	0.46	0.44	0.68	0.43	0.39	0.47	0.41	0.35	0.30	0.51	0.39	1.00	
C5	I would be very willing to invest my time and energy on activities related to this park.	0.40	0.40	0.41	0.45	0.46	0.31	0.34	0.43	0.44	0.38	0.37	0.40	0.39	0.50	1.00

All Pearson correlations are significant at the 0.01 level (2-tailed).

I: Park Identity dimension; D: Park dependence dimension; C: Park caring dimension

APPENDIX G: CORRELATION MATRIX - KEY VARIABLES

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Age	1																
2	Length of residence	.169(**)	1															
3	Environmental knowledge	-0.068	-0.076	1														
4	Environmental activities	-0.083	-0.078	.521(**)	1													
5	Living near park with geometric or natural landscape	-0.023	0.084	-0.012	.135(**)	1												
6	Park landscape preference – Manicured naturalistic	0.063	0.051	.103(*)	.107(*)	-0.055	1											
7	Park landscape preference – Geometric landscape	0.073	0.034	0.021	0.037	-0.073	.277(**)	1										
8	Park landscape preference – Naturalistic landscape	.106(*)	-0.042	.223(**)	.174(**)	-0.053	.574(**)	.297(**)	1									
9	Park landscape preference – Pathway landscape	0.032	-0.024	0.009	0.062	0.016	.433(**)	.567(**)	.457(**)	1								
10	Preference for the landscape of one's own park	.134(*)	0.020	.167(**)	.148(**)	-0.079	.575(**)	.635(**)	.653(**)	.583(**)	1							
11	Perceived uniqueness of – artificial design elements	0.013	-0.028	.178(**)	.256(**)	-0.093	.147(**)	.278(**)	.200(**)	.255(**)	.306(**)	1						
12	Perceived uniqueness of – natural design elements	0.039	0.008	.184(**)	.226(**)	-.157(**)	.113(*)	.122(*)	.136(**)	0.052	.192(**)	.541(**)	1					
13	Park experience – passive recreation	0.034	-.190(**)	.219(**)	.333(**)	.134(**)	0.077	0.092	.145(**)	.133(*)	.140(**)	.223(**)	.272(**)	1				
14	Park experience – being with family	.228(**)	-.180(**)	.227(**)	.255(**)	.103(*)	0.057	.187(**)	.121(*)	.106(*)	.198(**)	.137(**)	0.094	.388(**)	1			
15	Park experience – active recreation	-.133(*)	-0.068	.190(**)	.317(**)	0.071	-0.029	.135(**)	0.083	.147(**)	.131(*)	.292(**)	.155(**)	.334(**)	.298(**)	1		
16	Park-based social interactions	-.175(**)	-.180(**)	.156(**)	.322(**)	.121(*)	0.036	.168(**)	0.092	.202(**)	.130(*)	.284(**)	.179(**)	.619(**)	.232(**)	.530(**)	1	
17	Park quality evaluation – natural quality	0.092	0.002	0.057	.109(*)	-0.084	.245(**)	.285(**)	.217(**)	.202(**)	.386(**)	.324(**)	.390(**)	.209(**)	0.095	.103(*)	.219(**)	1
18	Park quality evaluation – orientation and comfort	.124(*)	0.077	.105(*)	.114(*)	0.015	0.084	0.098	.103(*)	0.057	.204(**)	0.064	0.037	0.089	.143(**)	.115(*)	0.065	.455(**)
19	General park satisfaction	.142(**)	0.023	0.099	.110(*)	-0.084	.259(**)	.252(**)	.245(**)	.234(**)	.416(**)	.261(**)	.247(**)	.173(**)	.139(**)	.124(*)	.163(**)	.831(**)
20	Identification with park meaning in general	.157(**)	0.029	.157(**)	.151(**)	-0.035	.127(*)	.162(**)	.174(**)	.185(**)	.244(**)	.326(**)	.332(**)	.232(**)	.159(**)	.123(*)	.157(**)	.443(**)
21	Park Caring	.139(**)	-0.031	.263(**)	.247(**)	-.106(*)	.201(**)	.230(**)	.205(**)	.197(**)	.272(**)	.252(**)	.281(**)	.293(**)	.316(**)	.193(**)	.229(**)	.327(**)
22	Park Dependence	.144(**)	-0.055	.116(*)	.158(**)	-.113(*)	.200(**)	.262(**)	.245(**)	.246(**)	.380(**)	.371(**)	.362(**)	.318(**)	.164(**)	.183(**)	.258(**)	.458(**)
23	Park Identity	.167(**)	-0.026	.194(**)	.189(**)	-.112(*)	.242(**)	.248(**)	.293(**)	.241(**)	.356(**)	.324(**)	.369(**)	.327(**)	.249(**)	.177(**)	.265(**)	.468(**)
24	Park upgrade preference – naturalistic landscape	-0.069	-0.021	.272(**)	.274(**)	-0.008	.169(**)	-0.032	.284(**)	0.063	.153(**)	0.067	.142(**)	.139(**)	.131(*)	0.065	0.077	0.079
25	Park upgrade preference – cultural contents	-.239(**)	-0.007	.141(**)	.125(*)	-0.004	0.037	.122(*)	0.062	.103(*)	0.066	0.046	-0.060	0.026	0.058	.110(*)	.108(*)	-0.043
26	Park upgrade preference – human intervention	0.063	0.039	0.081	.104(*)	-0.021	0.034	.201(**)	-0.078	.106(*)	0.051	0.064	0.040	0.032	.200(**)	0.063	0.058	0.074
27	Park upgrade preference – active recreation facilities	-.149(**)	0.029	0.101	.141(**)	0.035	-0.018	0.046	0.028	0.033	0.025	0.023	-0.093	-0.030	0.097	.186(**)	0.071	-0.066
28	Park upgrade preference – artificial design elements	-0.091	0.032	-0.022	0.043	0.024	-0.023	.104(*)	-0.093	0.015	0.011	-0.020	-0.013	-0.004	0.101	0.006	0.092	0.010
29	Park upgrade preference – natural design elements	-.115(*)	-0.030	.278(**)	.233(**)	-0.009	.155(**)	-0.015	.169(**)	0.041	.130(*)	0.045	0.059	0.053	.190(**)	0.090	0.067	-0.034
30	Park upgrade preference – commercial facilities	-.172(**)	-.112(*)	-0.015	0.063	-0.007	-.125(*)	-0.041	-0.071	0.001	-.124(*)	0.009	-0.063	-0.041	-.105(*)	0.073	.107(*)	-.155(**)
31	Behavioral intention – become active	0.011	-0.086	.210(**)	.228(**)	.113(*)	0.012	-0.047	0.102	0.029	0.081	0.032	0.065	.118(*)	.126(*)	.116(*)	.134(*)	0.031
32	Behavioral intention – feel sad	0.016	-0.037	.125(*)	0.031	.108(*)	-0.013	-0.049	0.024	0.007	0.032	-0.083	-0.017	.143(**)	.123(*)	0.005	.140(**)	-0.038
33	Willingness of participation	-0.028	-.164(**)	.328(**)	.395(**)	0.021	.169(**)	0.092	.204(**)	.134(**)	.159(**)	.179(**)	.185(**)	.251(**)	.287(**)	.266(**)	.334(**)	0.069
34	Neighborhood attachment	0.023	0.096	.189(**)	.176(**)	-0.018	.200(**)	.257(**)	.189(**)	.241(**)	.310(**)	.244(**)	.165(**)	.133(*)	.152(**)	.202(**)	.217(**)	.371(**)

*. Pearson correlation is significant at the 0.05 level (2-tailed).

**. Pearson correlation is significant at the 0.01 level (2-tailed).

N=368

	Variable	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	Age																	
2	Length of residence																	
3	Environmental knowledge																	
4	Environmental activities																	
5	Living near park with geometric or natural landscape																	
6	Park landscape preference – Manicured naturalistic																	
7	Park landscape preference – Geometric landscape																	
8	Park landscape preference – Naturalistic landscape																	
9	Park landscape preference – Pathway landscape																	
10	Preference for the landscape of one's own park																	
11	Perceived uniqueness of – artificial design elements																	
12	Perceived uniqueness of – natural design elements																	
13	Park experience – passive recreation																	
14	Park experience – being with family																	
15	Park experience – active recreation																	
16	Park-based social interactions																	
17	Park quality evaluation – natural quality																	
18	Park quality evaluation – orientation and comfort	1																
19	General park satisfaction	.729(**)	1															
20	Identification with park meaning in general	.328(**)	.492(**)	1														
21	Park Caring	.213(**)	.314(**)	.466(**)	1													
22	Park Dependence	.194(**)	.434(**)	.557(**)	.646(**)	1												
23	Park Identity	.280(**)	.458(**)	.627(**)	.749(**)	.799(**)	1											
24	Park upgrade preference – naturalistic landscape	0.096	.136(**)	.133(*)	.162(**)	.119(*)	.188(**)	1										
25	Park upgrade preference – cultural contents	-0.013	-0.042	0.062	0.102	0.007	0.063	.247(**)	1									
26	Park upgrade preference – human intervention	0.099	0.080	.144(**)	.208(**)	0.046	.133(*)	.255(**)	.292(**)	1								
27	Park upgrade preference – active recreation facilities	-0.005	-0.029	0.068	.138(**)	0.053	0.067	.231(**)	.445(**)	.300(**)	1							
28	Park upgrade preference – artificial design elements	-0.011	-0.007	0.100	0.048	0.029	0.020	.284(**)	.417(**)	.444(**)	.486(**)	1						
29	Park upgrade preference – natural design elements	0.081	0.014	0.071	.137(**)	0.040	0.084	.551(**)	.456(**)	.326(**)	.424(**)	.442(**)	1					
30	Park upgrade preference – commercial facilities	-.181(**)	-.180(**)	-.131(*)	-0.083	-0.095	-.134(*)	0.063	.321(**)	0.025	.337(**)	.264(**)	.229(**)	1				
31	Behavioral intention – become active	-0.009	-0.004	0.096	.198(**)	.120(*)	.111(*)	0.057	.123(*)	-0.010	.104(*)	-0.023	.192(**)	0.025	1			
32	Behavioral intention – feel sad	0.037	0.000	.143(**)	.192(**)	0.101	.161(**)	0.058	.129(*)	0.068	0.060	-0.011	.162(**)	-0.031	.587(**)	1		
33	Willingness of participation	0.080	0.083	0.090	.244(**)	.104(*)	.148(**)	.227(**)	.131(*)	.172(**)	.136(**)	0.071	.258(**)	0.042	.345(**)	.231(**)	1	
34	Neighborhood attachment	.284(**)	.396(**)	.405(**)	.412(**)	.443(**)	.502(**)	0.101	.123(*)	.184(**)	.161(**)	.125(*)	0.072	-0.051	0.042	0.040	.156(**)	1

*. Pearson correlation is significant at the 0.05 level (2-tailed).

**. Pearson correlation is significant at the 0.01 level (2-tailed).

N=368